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NATIONAL MUSEUM MELBOURNE

The Journal of the Department of Agriculture of Victoria, Australia.

January, 1924.

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Herd Test Movement in South Gippsland

Irrigation Experiments

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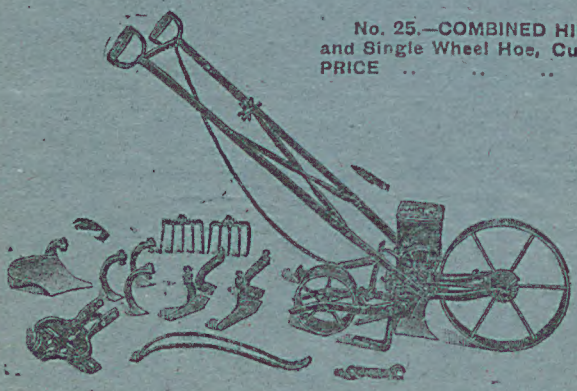

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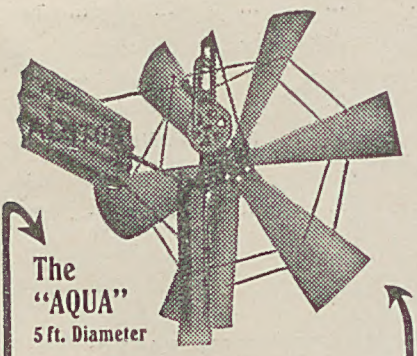

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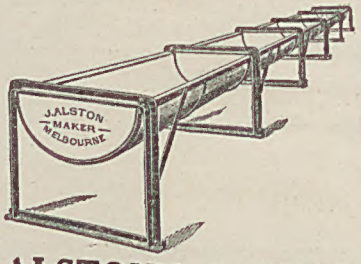

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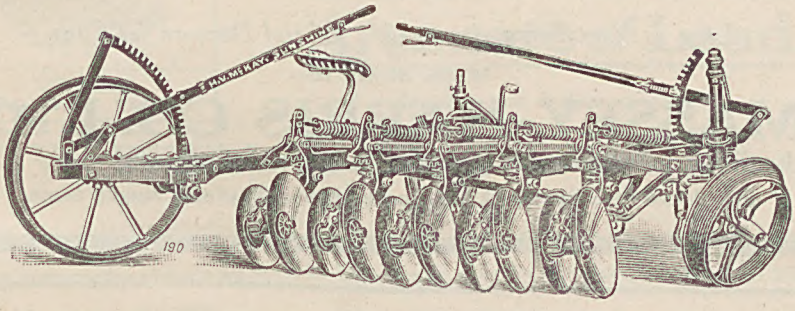

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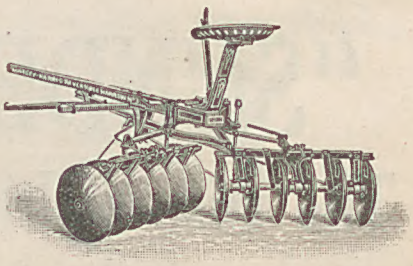

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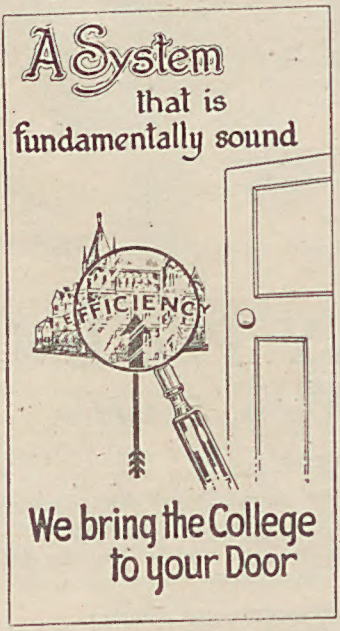

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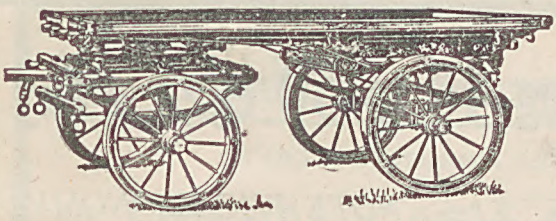

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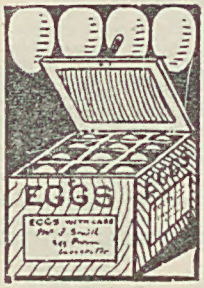

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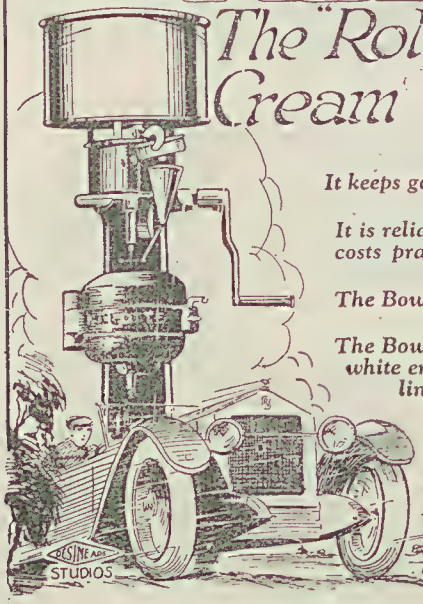

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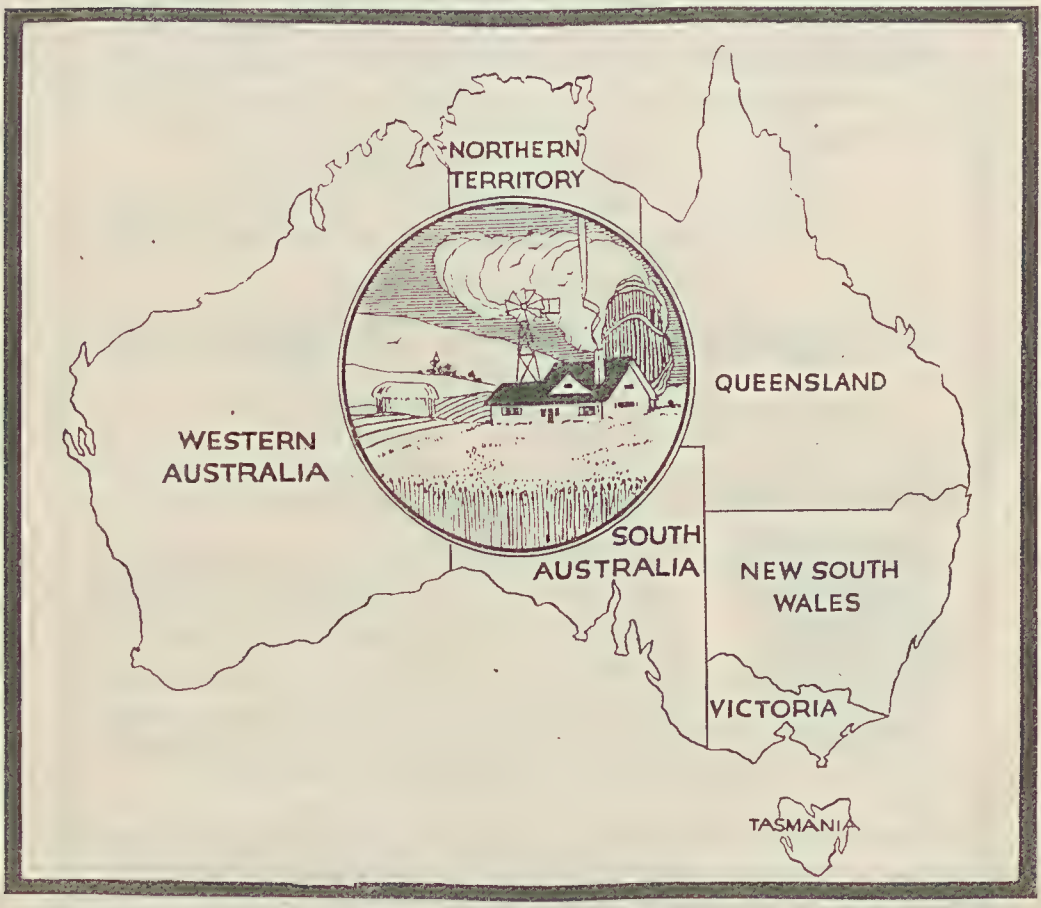

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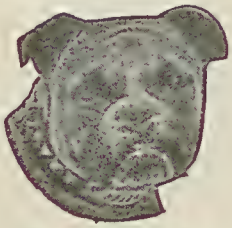

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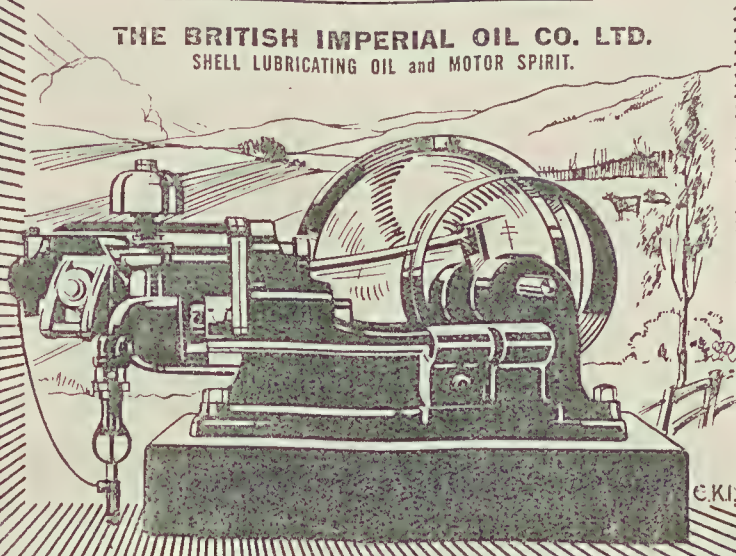

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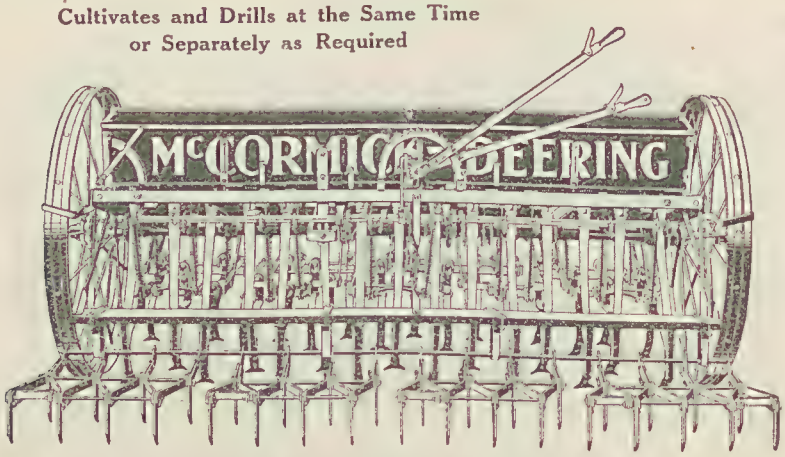

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THE CONTROL OF TUBERCULOSIS.*

By MARTIN F. WILLIAMS, Student.

(Final Honour Candidate for B.V.Sc., University Veterinary School, Melbourne.)

Before going into details concerning the control of bovine tuberculosis, let us take to heart the now classical saying of Pasteur, "It is within the power of man to eliminate infectious diseases from the face of the earth." Let us take this as a motto, and follow the steps of countries like Denmark, Norway, and Sweden, which have practically eliminated bovine tuberculosis from within their boundaries.

Any logical, efficient, and broad-minded system of control can be arrived at only by the study of the methods of spread and infection of the disease, and an impartial study and criticism of methods adopted in various countries.

It is recognised by pathologists that there are three main avenues of infection, namely, ingestion, inhalation, and congenital; and of these the last is by far the smallest. In Victoria, the amount of congenital tuberculosis in calves is estimated at about 0.3 per cent. of infected animals, the infection being due to the existence of uterine tuberculosis in the mother.

Inhalation is operative to its largest extent in adult animals, while ingestion and inhalation both play a part in the infection of calves, hence the good results obtained from isolation of affected animals.

* This article is, with the consent of the writer, lifted from his examination papers on State Veterinary Sanitary Science at the November, 1923, final examination for the degree of Bachelor of Veterinary Science at the Melbourne University Veterinary School. It is Mr. Williams' answer (verbatim) to one of the questions which required candidates to propound their views generally on the problem of the control of Bovine Tuberculosis. The paper was awarded 90 per cent. marks.

S. S. CAMERON, D.V.Sc., M.R.C.V.S.,
Director of Agriculture (Examiner).

Ingestion is the method of most importance, especially in calves, through ingestion of infected milk from cows with mammary tuberculosis, ingestion of infected pastures, &c.

The methods which are adopted in other countries are widely different in many respects. The system which has the largest number of followers is the Bang system, which operates in Denmark, Austria, Norway, and Sweden, and has been effective in bringing about a change in percentage of infected herds from an average of 30 per cent. to an average of from 2 to 3 per cent.

By this method, all the cows in the herd are tuberculin-tested, and the reactors and non-reactors separated. All premises on the farm are thoroughly disinfected, and isolation by double fence or road instituted. Separation is made as complete as possible by the use of separate attendants and utensils, but where this is not practicable, the clean cows are attended to first.

All calves are isolated at birth, and put on to clean nurse cows, or fed on clean milk or pasteurized milk, and tuberculin-tested at six months, when the non-reactors are added to the clean herd, and the reactors (the percentage of reactors is from 1 to 2 per cent.) to the infected herd. As the clean herd increases in size, the infected herd can be diminished in size by the fattening and slaughter of its members. It takes from three to ten years to build up by this method a clean herd. In Denmark there are no restrictions imposed on the sale of infected cattle, and the milk of reactors is sold with the milk of non-reactors, after the elimination of udder-infected cows. This system is essentially practicable, as is proved by the undeniable success which attends its use. The duplication of apparatus is a little cumbersome and costly, but, as tuberculin is supplied free by the Government in Denmark, the purchase of apparatus is the only cost. Its undeniable claim for consideration is based on its proven success.

Another system which has found great favour recently in the United States of America is the accredited herd system. This system aims at the voluntary submission by herd-owners to tuberculin testing and the voluntary suppression of reactors in the herd. After passing, without any reactors, two annual tuberculin tests, the herd is accredited free. All cattle introduced are quarantined and tested before admission. The success of this system is largely due to the realization by the American public of the increased value of tubercle-free milk, thus encouraging herd-owners to become accredited. The system would not work on a voluntary basis in Victoria as long as the public is content to use ungraded milk, and a campaign of public education would be an essential preliminary to its introduction.

In Manchester the system is adopted of examining centrifuged samples of milk for the presence of tubercle bacilli. Any positive findings are recorded, and the individual cows tested and eliminated. The great objection to this method is the fact that only a positive finding is of value, and the odds against finding a few bacilli from one cow after the dilution of the milk with that of a number of healthy cows are very large.

In Germany the system is adopted of inspection and slaughter of all clinical cases, and the isolation of all calves at birth. The belief is held that animals not showing clinical symptoms, but reacting to the

tuberculin test, play only a very small part in the transmission of the disease. Tubercle-free herds are built up from the calves, by feeding them on pasteurized milk and keeping them isolated.

The International Commission for the Control of Tuberculosis, 1910, drew up a series of recommendations for the control and elimination of bovine tuberculosis. They divided herds into two categories, namely, those heavily infected, which included herds containing 50 per cent. or over reactors to the tuberculin test, and those lightly infected, containing those herds with less than 15 per cent. reactors. The herds with intermediate percentages were allotted to either list according to the wish of the owner. The proposals of the Commission were as follows:—

(*a*) Heavily infected herds—
Isolate calves at birth; slaughter clinically-affected; feed calves on pasteurized milk; disinfect premises.

(*b*) Herds lightly infected—
(i) Separate reactors and non-reactors by road or double fence; treat as separate herds; disinfect premises.
(ii) Isolate calves at birth; put them on to healthy nurse cows or feed on pasteurized milk.
(iii) Milk of reactors to be pasteurized and used.
(iv) Reactors to be fattened and slaughtered under supervision, as the herd of non-reactors increased in size.
(v) Testing all calves at six months; testing new introductions.

Although there are no reports to hand as to the success or otherwise of this system, it appears on inspection to be quite practicable, and as more efficient than the Bang system as practised in Denmark, in that it stipulates pasteurization of infected milk, and does not allow the free sale of reacting cattle, and in just those particulars is its cost increased to an extent which, judging from the excellent results of the Bang system, is scarcely justifiable.

The system, as adopted in Victoria, of prohibition of generalized and udder tuberculosis in cattle, without compulsory slaughter, without any isolation of affected cattle, without isolation of calves, while it has done a certain amount in lessening the incidence of tuberculosis in that small portion of the State over which the Dairy Supervision Act is in force, is decidedly lax and inefficient. It merely prohibits cows clinically-affected from milk production. It takes no heed of the infection that is constantly being spread by them; it does not recognise, apparently, that dangerous udder infection can occur before manual examination of the udder reveals any abnormality, and it takes no steps to prevent infection of healthy calves. It must be condemned as a half-hearted, inefficient attempt to control the "white plague."

Before making any suggestions as to the control of the disease, it must be remembered that any efficient, logical, and practicable scheme must include certain essential features, which are as follows:—

(1) It must aim at stopping the spread of the disease. In this connexion it must be recognised that cows not clinically detectable, *e.g.*, those with commencing udder infection, are dangerous sources of infection.

(2) In order to prevent the great economic loss which accompanies any system of wholesale slaughter of affected cattle, it must seek to utilize these cattle in whatever manner possible.

(3) It must realize that the very great majority of infection is post-natal.

(4) It must realize the necessity for disinfection of premises which have been occupied by infected cattle.

In order to carry out the above fundamental principles, the steps necessary to be taken are—

(1) Tuberculin testing of all cattle, and separation and isolation on the lines before mentioned. Although it would appear that the sale of affected cattle and affected raw milk, by spreading infection through the country, would call for slaughter of affected cattle under supervision, and pasteurization of milk to complete the scheme, the result of experience in European countries would point to the fact that this danger is very small. From the point of infection of the human child, milk sold for human consumption should be branded as tubercle-free or non-tubercle-free.

(2) Any system of wholesale testing and slaughtering is bound to fail because of the great economic loss involved. It must be realized that, for human consumption, the pasteurized milk of reactors is quite wholesome, and that as the clean herd increases in number, the reacting cows can be fattened and killed for meat.

(3) If it be realized that the majority of infection is post-natal, and by the method of ingestion of infected milk on the part of calves, then the obvious step to take is to isolate calves from infected mothers, put them on healthy nurse cows or clean or pasteurized milk.

(4) It is obvious that if clean cattle are put into buildings which are soiled with uterine discharges, infected fæces, and sputum from tubercular cows, they stand a good chance of infection, which can be prevented by the disinfection of premises with such substances as formalin, perchloride or biniodide of mercury.

Under the system as thus suggested, with the Government supplying tuberculin for testing of herds and newly introduced cattle, the only cost to the farmer would be the cost of duplication of apparatus and buildings. In a herd with a small percentage infected, he would do well to save this expense by getting rid of the infected cattle. The system advocated is practically the Bang system, as used on the Continent, and the factors in its favour are the low operative cost, the maximum utilization of infected cattle, with the maximum prevention of spread of infection. The biggest argument in its favour is that "Nothing succeeds like success."

HERD TEST ASSOCIATIONS.

MOVEMENT IN SOUTH GIPPSLAND.

By W. J. Yuill, Dairy Supervisor.

Is Testing Worth the Cost?

Many people, unacquainted with the country, consider Gippsland the garden of Victoria. It is not that, however, but undoubtedly the time will come when it will be so regarded, for with its mild summers and abundant rainfall much is possible. Gippsland differs in a great many ways from the Western District of Victoria, but in none more than in the varying quality of its land, ranging from the wonderful flats on the Tarwin, Morwell, and Latrobe Rivers to thousands of acres of poorest grazing land. Even in the hill country there is a great variation in the soil—some of it is worth from £30 to £40 per acre, while some is of no agricultural value whatever.

Within the boundaries of South Gippsland are extensive areas of low-lying undulating plains, which extend several miles in from the coast and rise to some of the steepest hill country in the State. Here there is an average rainfall of approximately 40 inches, and the growing of a cereal and a summer crop is possible in any year. Thus dairying is a natural industry. Two enemies have to be fought against—rabbits and bracken fern. During the war period both strengthened their hold owing to the shortage of labour, and now the wonderful pastures of rye, cocksfoot, and clover, once so plentiful, are rare. Consequently, better methods of farming, such as conserving fodder, top-dressing pastures, and herd-testing, are forced upon the people.

Those who are fond of quoting Victoria's failure to keep pace with the leading dairying countries in the matter of herd-testing will be surprised to hear that during the past season, in the area bounded roughly by Toora and Leongatha, on the Southern Gippsland line, and Morwell, on the main Gippsland line, five Associations were in operation, viz., Toora and Welshpool, Stony Creek, Tarwin Lower, Mirboo, and Yinnar. These five tested in all approximately 5,000 cows. The Yinnar and Tarwin associations have been in operation for two years, while the others have recently completed their first year of service.

The question is sometimes asked—Does the information gained or the advantages arising from herd-testing justify the cost? This question can perhaps best be answered by asking another. If herd-testing associations are of doubtful value, why is it that at the end of 1920, in Denmark, Norway, and Sweden, over 1,200 such Associations were in existence, in Canada and the United States of America over 500, in Germany some 330, and in Great Britain some 70 or 80?

Recent figures credit Wisconsin, United States of America, with over 140 active associations. In thirteen years the average production of butter-fat from approximately 1,800,000 cows in that State has been raised from 150 lbs. to 185 lbs. During the same time the average of the Herd Test Association cows has been raised to 6,500 lbs. of milk and 260 lbs. of butter-fat.

Herd-testing is not a fad; it has long since passed its period of trial. It is because history repeats itself wherever the test is applied that men are using the system to prove each animal and are culling the unprofitable cows. It is because herd-testing is scientific that the results are

unquestionable, that it is being incorporated in the agricultural science of the leading dairying countries.

The Gippsland Method of Testing.

In South Gippsland the "official system" is in operation. Every association employs a testing officer, who visits the farm of each member, and does all the work of weighing the milk, taking the samples (including a skim test if requested), and all the testing work is carried out on the farm. Milk and butter-fat records are worked out, and copies are left with each farmer. The farmer provides accommodation for the tester on each test day and feed for the horse.

Under the official system, the whole of the work is carried out by one whose mind is concentrated on the work. Being trained by continual practice, there is less likelihood of error than if the work were done by an amateur. Further, it is an education to all on the farm, particularly the younger members.

Each Association works under its own regulations, but at a conference of delegates from the various Associations held at Stony Creek it was decided that the working methods should conform as far as possible to the Standard Test, as carried out by the Department of Agriculture. The aliquot system of taking the sample is now used by every Association on the basis of 1 c.c. to each pound of milk. This is preferable to the dip sample, taken from night and morning milk in unknown proportion. With the aliquot system the sample is in proportion to the bulk milk:—

	Evening.	Morning.	Total.
Bulk milk ..	15 lbs.	20 lbs.	35 lbs.
Sample ..	15 c.cs.	20 c.cs.	35 c.cs.

The amount of milk for the month is computed from the milk weighed by the tester on the day of his visit. At the end of the season a report is given to each member of the amount of milk and butter-fat produced. In some Associations the report takes the form of a certificate stamped by the secretary.

The keenly-interested, and perhaps the sceptical, will ask—Do the Herd Test Association results compare with the butter factory returns? It must be remembered that actual production can only be ascertained by weighing and testing the milk daily. Daily weighing insures a correct record of the milk produced, and monthly testing is sufficiently correct to make more frequent testing unnecessary.

Keen association members weigh daily, others weigh weekly; but for association work all records are made from the weights of milk taken on the day of the official tester's monthly visit. Some dairymen with the overhead system of milking machines put the buckets on for this day, for it is not sound practice to hand-milk a herd for testing purposes when machines are in use at all other times. When allowance is made for the many leakages of fat which occur under any system, it is surprising how little variation exists between the Herd Test Association and the butter factory records for the same period.

If ordinary care is observed on the undermentioned points, the difference should not be more than from 5 to 7 per cent., while in many cases it will be found within a 5 per cent. limit. The greatest variation will occur on those farms where pure-bred and picked calves receive new milk for several weeks, and where cream is used for butter making. Besides, allowance must be made for milk and cream used in the home.

Mr. H. J. Nuttall's "Dainty."
Last season's record:—11,000 lbs. milk, 3·3 test, 333 lbs. fat.
Since 15th December "Dainty" has yielded an average of 54 lbs. milk of 3·4 test daily.

Mr. H. J. Nuttall's "Bertha."
Last season's record:—9,239 lbs. milk, 4·9 test, 456 lbs. fat.
Since 8th August "Bertha" has averaged 44 lbs. milk of 4·6 test daily.

Both cows are of exceptional type and constitution, but the District Herd Test Association records show that during the past two seasons "Bertha" has produced over 100 lbs. butter fat more annually than "Dainty."

There is often a very serious loss in the skim milk. Bad skimming separators have been found to be losing as high as .3 per cent., or three-tenths of a lb. of butter-fat from every 10 gallons of milk. In the case of a separator losing .03 per cent., the loss of fat from a cow producing 5,000 lbs. of milk would be 1.50 lbs. Separators losing from .08 down to .03 of butter-fat are common. When these many factors are considered, it will at once be seen that it is unfair to compare the results obtained under the two systems. The factory results are from cream delivered, while the Herd Test Association results are from a computation of what the cows produced.

Precautions Necessary.

Care must be observed that the testing day is one of strictly 24 hours. This is essential, for any loss or gain of time will represent a difference in the milk yield for the day, and any such error will be magnified thirty times in the monthly computation.

The owner must see that the herd is not turned into new feeding at about the time of the tester's visit, for the first few days on any fresh succulent feeding will usually increase the milk yield. Although these and other factors have to be guarded against, and often cannot be avoided, yet when the Herd Test Association figures are compared with the butter factory returns the annual results should be within the limits already stated.

What Testing Revealed on Gippsland Farms.

Old ideas are said to die hard. This is certainly true in dairying work, for despite the great amount of data available from experimental work, and the amount of practical information on hand, there are yet to be found dairymen who maintain that a cow may be a good producer in some years, and a poor or indifferent one in others; therefore testing work has little value. Certainly local factors do operate, such as sickness, accident, abortion, and calving out of season. But under normal conditions, with abundant feeding, the same cows will be at the top of the herd in every year, while, on the other hand, those animals that are dairy cows in name only will always be at the bottom.

In this connexion it is interesting to note the results of comparisons made on the farm of Mr. H. J. Nuttall, of Yinnar. Last year, when a great increase had taken place in the production of his herd as a result of better feeding, the best five cows were the same as had given the best results during the previous year. Hereunder are details of the yields for both years:—

Name of Cow.	1922.			1923.		
	Milk.	Percentage.	Butter Fat.	Milk.	Percentage.	Butter Fat.
	lbs.		lbs.	lbs.		lbs.
Jinny	7,840	5·48	429·2	10.926	5·04	551·0
Bertha	6,773	4·9	331·1	9,239	4·94	456·7
Mary	6,437	4·75	306·1	8,943½	4·66	417·4
Dina	8,583	4·28	367·2	9,903	4·01	397·7
Ida	8,340	4·0	327·1	9,424	4·03	380·0

Type is not a sure indicator of production. Testing has proved that there may be as great a difference as 100 lbs. in the yield of butter-fat from each of two cows of similar type and on similar feed. Yet many men claim to be able to pick the good producers on type and other so-called infallible signs, such as the colour of the milk, the yellow pigment in the skin, or the escutcheon, and notwithstanding that it is common knowledge that the cream rising on a bottle of milk may vary greatly in percentage of butter-fat, this is accepted in some instances as a sufficient test.

Dina. Mary. Ida.

Three of the Leading Cows in Mr. Nuttall's Herd.

	Dina.			Mary.			Ida.		
	Milk.	Test.	Fat.	Milk.	Test.	Fat.	Milk.	Test.	Fat.
	lbs.		lbs.	lbs.		lbs.	lbs.		lbs.
1922 ..	8,583	4·2	367	6,437	4·7	306	8,340	4·0	327
1923 ..	9,903	4·0	398	8,943	4·6	417	9,424	4·0	380

Great increase in production due to better feeding.

It is readily admitted that the majority of the high producers are of good dairy type. (One has only to devote a few hours at the Royal Show among the known producers of the State to see this.) But there are cows of dairy type and strong constitution that are not only indifferent milkers, but unprofitable dairy cows.

The experience of Mr W. A. Vagg, of Yinnar, may be cited. Having had the misfortune to lose several cows by poisoning, he immediately replaced them with the reputed best from a local clearing sale. They were good type dairy cows, yet they failed with one exception to reach the average of the home-bred two-year-old heifers. Mr. Vagg is one of the heaviest feeders known to the writer. His best ten records, including those of four heifers, in the Yinnar Association during 1922 averaged 7,000 lbs. milk and 349 lbs. butter-fat. These cows are the result of years of breeding for production.

Mr. Nuttall's Dairy Herd.

(In 1923, 26 mature cows averaged 7,741 lbs. milk and 335 lbs. fat.)

Hereunder are the returns from Mr. Nuttall's herd for two years. The great improvement shown in the figures for the second year is due to culling and better feeding:—

Year.	Days in Milk.	Milk.	Average Test.	Butter-Fat.
		lbs.		lbs.
1922 ..	242	5,342	4·56	243
1923 ..	265	7,106	4·34	308

If type were depended on, the leading cow in the Mirboo Association would have been overlooked by the most critical judge, for she has no particularly strong feature in that direction. Consistency and a high average test are her chief attributes. Her daily milk never exceeded 35 lbs., yet her record of 7,365 lbs. of milk and 447 lbs. of butter-fat in 273 days (at the end of which time she was still making 23 lbs. of milk), speaks for itself. Further, she calved again within twelve months. Until the test figures revealed her value, her owners (Mrs. Agnes Smith and Sons) considered that they had many better cows in their herd of 37 head that averaged 5,135 lbs. of milk and 270 lbs. of butter-fat.

Testing the Only Reliable Guide.

Some dairymen have a "good eye for type." But it must be admitted that the type most commonly seen is evidence that few men possess the ability to pick cows on type, or that it is not taken seriously into consideration. If the fact of possessing a yellow pigment in the skin, particularly the ear, is an indication of an animal of good dairy quality and one capable of yielding milk rich in butter-fat, then the majority of the cows carrying Channel Island blood would give heavy butter-fat returns, for a yellow skin is characteristic of such cows, particularly pure-bred animals. Herd-testing will prove the milk of many such cows to be low in butter-fat percentage, and that many cows lacking the quality will give milk high in test. It will also prove that yellow, rich-looking milk is not necessarily rich in butter-fat, and, on the other hand, that milk not possessing this characteristic may have a high percentage of butter-fat. An example may be quoted of one cow in a herd of 30 that never tested over 4 per cent., yet her milk was at all times the richest, if appearance was to be relied on.

The main reason for testing is to put every cow in her true position in the herd, according to her producing ability. With this knowledge gained, automatically there is received other valuable information essential to progress. Surer progress is made when the producing value of each cow is known, for there is less of the element of luck, and more of the element of control.

It has been said that Herd Test Association work is not likely to assist in building up the dairy industry because culled cows are being sold on the market to the best advantage, and are therefore likely to return to the herds of non-testing owners. Frankly, it must be admitted that association members are more interested in themselves than in the welfare of the industry, and, further, that they certainly are not paying a fee for testing their cows in the interests of their brother farmers. The industry does benefit, for testing owners are not breeding from the lowest producers; consequently, to that extent less low-grade animals will be raised in each district, and definite knowledge is available of each animal that is reared. But while the movement remains voluntary the objection raised is likely to remain.

Under a State-controlled compulsory system the position would immediately assume a different aspect. Some system of branding cull cows would be imperative.

In an average year, after making due allowance for the difference which exists between farms and farmers, any mature cow, working under normal conditions, failing to produce 175 lbs. butter-fat should carry no other mark than that of the spayer's knife.

Is it any wonder that the average production per cow in Victoria is approximately only 150 lbs. of butter-fat when there are to be found in good herds cows that fail to produce even 130 lbs. when receiving liberal supplies of feeding? Many good herds contain cows of low-producing ability. The following figures will show to what extent this may be so. In each instance the cows tested were mature and thoroughly sound. The difference will be found to exist in low-producing herds also:—

Yield of Six Best Cows.		Yield of Six Worst Cows.		Difference.	
Milk lbs.	Fat lbs.	Milk lbs.	Fat lbs.	Milk.	Fat.
		HIGH PRODUCING HERDS.			
45,697	2,066	21,679	1,013	24,018	1,053
43,491	1,868	22,829	1,020	20,662	848
44,037	2,309	29,733	1,398	14,294	911
		LOW PRODUCING HERDS.			
25,587	1,071	18,798	714	6,789	357
23,122	1,063	15,614	628	7,508	435
		EVEN PRODUCING HERD (35 COWS).			
25,952	1,358	24,202	1,171	1,750	187

Herd Testing Proves Each Cow.

In addition to proving the producing ability of each cow in the herd, association work (or private work of a similar nature) will show which cows are sufficiently dominant in dairy character to reproduce it in their progeny.

Students of Mendel's laws are aware of the reason why many cross-bred cows fail to reproduce their virtues in their offspring. In the comparatively short experience of Herd Test Association work in South Gippsland, many such instances are known. In one case a cow was retained, together with all her female progeny, because of their supposed excellence. Testing proved that there was not a worthy animal in the whole family. On the other hand, in a herd of 50 cows tested for the first time only sixteen produced over 200 lbs. of butter-fat, and of this number over half were the progeny of three cows. The two cows in the Mirboo Herd Test Association that produced over 400 lbs. butter-fat were dam and daughter. A striking example of this character is shown in Mr. P. Anderson's herd in the "Susie" family given below:—

Susie, 8 years,
6,934 lbs. milk; 4·8 test; 338·2 lbs. fat.

Stella, 5 years,
5,375 lbs. milk; 5·8 test; 313 lbs. fat.

Silvery, 4 years,
6,335 lbs. milk; 6·3 test; 400 lbs. fat.

Sybil, 17 months,
2,901 lbs. milk; 6·1 test; 179 lbs. fat.

Herd Test Association work proves that the majority of the leading herds carry the blood of the best strains of the dairy breeds. Many bulls from the best-producing cows in the State have been introduced into South Gippsland since the Standard Test has been in operation. Very few dairymen can afford to purchase pure-bred females, but the certain information of the advantages accruing from the use of pure-bred bulls will greatly influence dairymen to secure a bull from high-producing ancestry of the breed that they fancy most.

Herd Testing Proves the Bull.

A very common statement has it that the bull is half the herd. Undoubtedly in this State the present low average production per cow must be largely attributed to the animal which is "just a bull" and nothing more. While scrub or grade bulls fail to improve production, it is true in a measure of pure bulls, for all such are not necessarily good dairy animals.

Incalculable service has been rendered to the dairy industry by the Standard Test of the pure breeds. Again and again has the advantage been shown (in all breeds) of using a sire from high-producing ancestry. The positive value of a bull can be known only after his daughters have been tested for a term. The best three-year-old heifer in the Mirboo Association, owned by Mr. T. W. Clark, of Allambee, produced 6,318 lbs. of milk and 335½ lbs. of butter-fat. She is by "Illustrious of Gowrie Park," by "Wallace" *ex* "Ida," whose production was 605½ lbs. butter-fat under the Standard Test. The leading herds in Yinnar, Mirboo, and Stony Creek Associations were all bred from pure bulls from high-producing ancestry.

A study of the herd records of Mr. Peter Anderson, who owns the leading herd in the Stony Creek Herd Test Association, will show very conclusively the value of using pure-bred bulls, for his system of feeding is the same now as when the herd was first tested some sixteen years ago. By working along the lines of Bull Clubs and Herd Test Associations, and by the better feeding of dairy herds, the Danish dairy farmers are said to have doubled the average yield per cow in twenty-six years. Mr. Anderson has, however, increased the average yield of his herd by 113 per cent. in sixteen years, as the following figures show:—

	Averaged Fat (lbs.).
1906–07.—Twenty cows the progeny of scrub bulls	135
1914–15.—Twenty-two cows the progeny of a pure Jersey bull ..	173½
1920–21.—Twenty-five cows the progeny of a pure Jersey bull ..	226
1921–22.—Twenty-four cows the progeny of a pure Jersey bull ..	254½
1922–23.—Twenty-six cows the progeny of a pure Jersey bull ..	290½

Mr. P. Anderson's "Meg"—5 years.

Milk.	Test.	Fat.
lbs.		lbs.
8,265	4·8	405

Mr. P. Anderson's "Brindle"—6 years.

Milk.	Test.	Fat.
lbs.		lbs.
7,536	5·4	414

Mr .P. Anderson's "Flossie"—5 years.

Milk. lbs.	Test.	Fat. lbs.
7,290	5·6	412

Mr. P. Anderson's "Silvery"—4 years.

Milk. lbs.	Test.	Fat. lbs.
6,335	6·3	400

Hereunder are the figures for twenty-five members of the herd—the progeny of pure-bred bulls—for the year 1922-23.

By a Son of Larkspur's Angler.				By a Son of Starbright's Carnation Fox.				By New Edition of Melrose, by Handsome Boy V., by Pretty Nobel.			
Age.	Milk.	Per Cent.	Butter Fat.	Age.	Milk.	Per Cent.	Butter Fat.	Age.	Milk.	Per Cent.	Butter Fat.
14	6,637	5·3	355½	6	7,536	5·4	414	4	6,335	6·3	400
11	6,125	5·6	347½	5	7,290	5·6	412	4	6,258	5·6	317
8	6,670	5·1	340	5	8,265	4·8	405	4	5,026	5·9	299
8	6,934	4·8	338	5	6,585	5·5	367	2	4,215	5·8	247
7	6,851	4·8	334	6	6,863	5·3	364	17	3,548	6·05	215
10	7,128	4·4	319	5	6,018	5·9	362	months			
14	7,053	4·3	305	6	6,342	5·3	340	17	2,901	6·1	179
8	6,204	4·6	288	5	5,375	5·8	312	months			
7	4,353	6·1	268	6	4,249	5·1	222¼	3	1,727 (117 d	5·9 ays, la	93 to in)

These figures, as already stated, are from the butter factory returns. During the past year the average return in 246 days was, according to Association records, 5,859 lbs. milk and 313⅓ lbs. butter-fat, while the average from the butter factory was 290½ lbs. fat—a difference of approximately 7 per cent.

These figures can undoubtedly be improved, as, owing to the difficulty in securing suitable labour, no cropping is now attempted for summer and autumn feeding. On the other hand, 85 acres of Mr. Anderson's farm, on which the dairy cows are grazed, is probably equal to any pasture land in Victoria, being a portion of the far-famed Tarwin River flats. The principal grasses are rye, Dutch white (*T. repens*), alsyke (*T. hybridum*), and strawberry (*T. fragiferum*).

With cows of known producing ability and proved bulls, their calves automatically receive a value previously unknown. More care and better feeding are natural results. Any one who is conversant with the usual feeding methods and treatment of calves will readily admit that there is much room for improvement. Mr. Anderson feeds his calves on new milk for a week, and then gradually puts them on to skim milk with linseed meal cake (as a butter-fat substitute) and lime-water. One of the first steps towards success in dairy farming is care of the calves; they should never have to begin life on a limited ration of cold skim milk, nor should they at any time be huddled in a bleak, wet pen.

A growing demand exists for young females from proved cows, and a keen demand brings higher values. It is safe to assert that such stock are making values at least 100 per cent. higher than market values for similar stock from untested dams. The writer is asked repeatedly for information as to where young stock from proved cows can be purchased, and it is a question hard to answer, for owners whose herds are being tested are retaining their best calves to build up their own herds.

Herd testing proves the great need of better feeding. With very few exceptions, the leading dairymen are those who, in addition to keeping the best stock, are also endeavouring to provide adequate supplies of feed suitable for milk production. But even when this is done, no sure progress can be depended on unless definite knowledge is secured

as to which cows are giving the greatest percentage of profit, and this can be ascertained only by some system of milk recording and testing for the butter-fat content.

Some South Gippsland Herds.

At Yinnar, where a Herd Test Association has been in operation for the past two years, some excellent results are being produced.

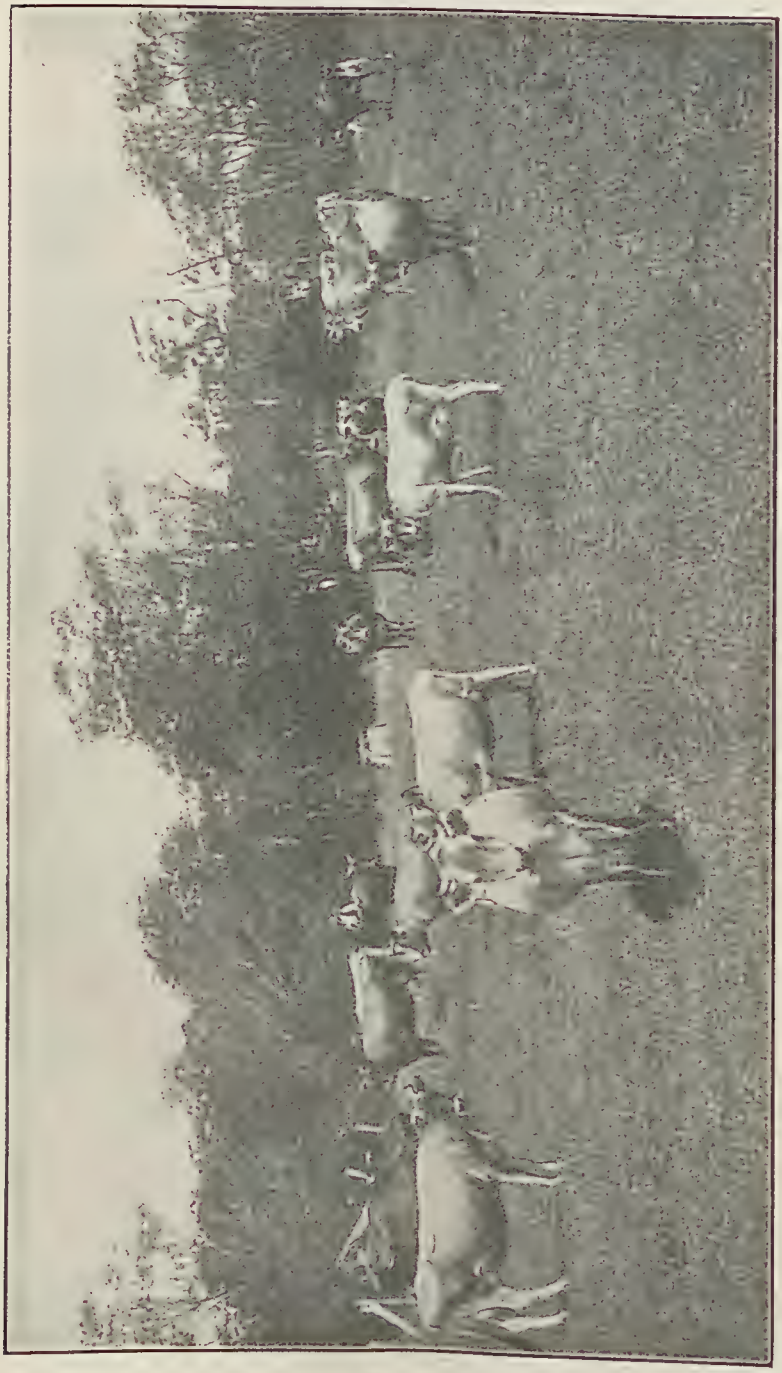
Mr. James Nuttall's herd of 41 cows has just concluded a unique year of production. This herd is run on the share farm system, and milked by hand. It was heavily culled after the first year of test, when 47 cows were milked, with an average production of 5,342 lbs. milk and 243½ lbs butter-fat. During the past year the average was increased to 7,106 lbs. milk and 308½ lbs. butter-fat. The average number of days each cow was in milk was 268. In compiling the average no allowance has been made for age or for accident. One cow whose record is included went dry, after being seriously bloated on clover, when only 170 days in milk. Owing to so many of the cows milking longer than the testing period, and to the fact that only two calves were reared, the average returns from the factory were considerably higher than the Association's returns.

Mr. Nuttall's farm is situated on the Morwell River, at Yinnar, The flats are divided into eight paddocks of varying size, and the herd is grazed for a few days in each paddock. This insures a fresh, sweet pasture and the maximum growth. The grasses are mainly rye (which makes rapid growth in the spring), while Dutch white (*T. repens*), red clover (*T. pratense*), and strawberry clover (*T. fragiferum*) predominate during the remainder of the year.

The herd is composed of Jersey grade cows of exceptional dairy type. This is particularly true of "Jinny," the leading cow in the herd during the two years that it has been under test. She is out of a cow bred by Mr. Wm. Woodmason, of "Melrose" fame, and by an unregistered Jersey bull bred by Mr. Felmingham. "Jinny's" production is of special merit, for during the first year of test her record of 7,840 lbs. milk and 429 lbs. butter-fat was made under exactly the same conditions as the record of the other 46 cows in the herd. She received no special treatment previous to the test, for the very good reason that her owner never imagined her to be the "top of the herd." He frankly admits that the cow he fancied most prior to the test was sold among the first year's culls.

During the past season, when "Jinny's" record was 10,926 lbs. milk and 551 lbs. butter-fat, she received similar treatment to the other members of the herd until March, when she began to receive a ration of bran, maize, and chaff. At the conclusion of the test term of 273 days she was still producing 25 lbs. milk testing 7 per cent. Throughout the winter months "Jinny" was rugged and fed as a cow of her value should be. Mr. Nuttall has recently had the great misfortune to lose this cow, she having died from an attack of milk fever a few days after calving.

Mr. Nuttall considers that too much importance cannot be placed on the sire and on the feeding. During the season just past he fed 27½ acres of Japanese millet and 8 acres of maize to his herd. He anticipates putting in 35 acres of Japanese millet for the coming season. The practice here is to sow millet as deeply as oats, instead of adopting the usual



Mr. P. Anderson's Dairy Herd.

surface sowing. The former method is strongly recommended by the writer, except in stiff clay soils which set after rain. Deep sowing gives a stronger root hold and a command over more moisture should dry weather be encountered.

"Retford Stirling," by "Matilda's Nobel," a bull bred at Retford Park, New South Wales, is the sire now in use. He was previously used by Mr. S. Rowe, of Mt. Eccles, where his progeny are giving satisfaction.

Mr. Nuttall is an enthusiastic supporter of Herd Test Association work, and considers that several years of testing are needed to give a full knowledge of the herd. His returns per cow from the factory during last year were £26, and his cheques from pig sales amounted to £270.

Mr. Thos. Collins' herd of 23 cows finished second in the Yinnar Association's herd average, with 6,343 lbs. milk and 296 lbs. butter-fat. This herd was also heavily culled after the first year's testing experience,

Value of the Herd Test Movement.

The co-operative spirit of the movement is seen at its best in the Association meetings, where the many phases of dairy farm work are discussed. Each member is given the opportunity of discussing the merits of the particular breed he fancies. Further, the discussions give rise to a deeper interest in the question of feeding and breeding, top-dressing pasture, disease control, and kindred problems

In Victoria the herd test movement is but in its infancy, and is gradually spreading. In those districts where it has been adopted the visits of the tester are looked forward to, for members are always anxious to know what results for individual cows the test will reveal.

No great advantage can be expected immediately, for while culling can be commenced in the first year, building up the herd is quite a different matter, and many cows may need to be proved before a high-producing herd is attained. When the average production of butter-fat reaches 300 lbs., it will be no light task to maintain it, and a praiseworthy work to improve it. It is the small dairy farmer who has the greatest need for a high-producing herd, and unfortunately it is the small herd that makes the cost of testing so high, for a day has to be spent at each farm irrespective of the number in the dairy herd there.

A tester can work only a limited number of herds per month. Therefore the revenue required can be secured only by a high rate per cow, when the aggregate number of cows is low.

Undoubtedly the most serious obstacle to the increase in the number of Associations in this State is the cost, which in the system in use in South Gippsland, ranges from 4s. to 5s. per cow per annum. This, it must be admitted, is somewhat of a tax on young men starting out in the industry with limited capital. But the system is of as much concern to them as to any one else, for it is common to see at clearing sales great competition for cows of an "unknown quantity", entirely because of some supposed quality.

When the advantages that accrue from testing work become more widely known and greater confidence is placed in the work, Victoria

as a dairying State can hope to start out to overtake the Danes, whose average production per cow is at least 75 per cent. higher than ours.

With a herd producing sufficient revenue to give a satisfactory return for labour and capital invested, rural life is sufficiently attractive to be a big factor in combating the drift to the city. For whether it be town or country, the revenue received is the determining factor; not, as so often stated, the many advantages and attractive phases of city life.

Rural population is needed in Victoria, and it can be said with certainty that any man who will learn his lesson from the leading members in the Herd Test Association can hope in a short time to overtake many who have been a life-time in the industry. Business methods must be applied to dairying work, and there is no other factor more firmly based on business principles than Herd Test Association work.

NATIONAL MUSEUM MELBOURNE

Equipment Required for Herd Test Association Work.

A 12-bottle Babcock testing outfit is of sufficient size to deal with a herd of any size. Larger machines, of course, will save time, but they cost more, and unless of the aluminium type, more weight to carry about. With the 12-bottle size, three sets of test bottles will greatly help to speed up the work in large herds. If assistance is given to turn the machine, the operator can pipette a second set of tests, while the assistant is whirling the previous set.

100 c.c. milk sample bottles are large enough for all purposes. A few drops of formalin is needed in hot weather to keep the sample from souring. An acid burette used in place of the 17.5 measure will help to facilitate the work.

Some equipment is necessary for heating the milk samples prior to taking the test, and for keeping the test bottles up to the required heat, while the tests are being read. Plenty of hot water is essential. A petrol or kerosene tin cut lengthwise, with a wooden frame to keep the bottles upright, and another tin cut the opposite way, will serve the purpose. A copper tray made to hold twelve test bottles will just fit into a kerosene tin, which should be cut high enough to allow the water to come to the top of a test bottle. Two boxes of sample bottles, one with a double tier, will be found suitable for packing on the vehicle. For small herds; only the top section of bottles need be taken out.

Equipment and Approximate Cost.	£	s.	d.
12-bottle Babcock testing machine and set of glassware (includes milk pipette and acid measure)	9	10	0
100 milk sample bottles (100 c.c. size) with corks ...	1	7	6
Two boxes (one a double tier) 50-bottle size	3	10	0
Milk scales	3	0	0
Two skim test bottles at 4s., two dozen extra milk test bottles at 2s.	2	16	0
Two graduated sampling pipettes at 8s. 6d.	0	17	0
Acid burette and milk thermometer	1	5	0
Bottle of formalin	0	4	0
	22	9	6

GEELONG FARM COMPETITION, 1923.

Report of the Judge, H. A. Mullett, B.Ag.Sc., Senior Inspector of Agriculture.

The object of the farm competition conducted by the Geelong Agricultural and Pastoral Society is to promote better farming methods, sound farm management, more effective improvements, and to secure improvement of the farm environment generally. Although the competition is now only in its second year, there is evidence that it is having the effect for which it was created, a result which must be very gratifying to the society.

Many of the farms judged were entered last year. On some of them substantial improvements had since been effected, and on all of them at least some progress had been made. Thus Mr. W. J. Muhlebach had installed a comprehensive water supply system under which water was laid on to each paddock on his farm, at a cost of some £300. Many competitors, including this one, had given some attention to the planting of additional shelter trees for their live stock, and to fencing. In several instances some modification for the better had been made in the farming methods practised, and in two cases new studs of live stock had been constituted.

The Competition.

Profiting by its experience last year, the society modified the scale of points somewhat, and subdivided the original class A into two classes. In all, four classes were open for competition—

A.—For mixed farms, 100 acres or over, whose principal source of revenue is from cereals and sheep.

B.—For mixed farms, 100 acres or over, whose principal source of revenue is from dairying, pig-raising, orcharding, &c.

This subdivision was made because of the obvious difficulty of comparing farms, differing so widely as do the above, on the same scale of points.

In addition, there was a Class C for mixed farms under 100 acres in area, and Class D for farms owned by returned soldiers settled under the Repatriation Scheme.

There were eight entries in the various sections, viz., two in A, two in B, one in C, three in D. This is three less than the number competing last year, and many less than a rich district like Geelong is capable of putting into the field. It is suggested that a better entry might be obtained if the society held an inter-district competition concurrently with its present competition. For the purpose of such a competition, Geelong could be divided into a number of districts. A committee representative of each could then nominate, say, four candidates, one in each of the classes, the district securing the highest aggregate of points to be adjudged the champion.

The District.

From a soil, climatic, and market point of view, Geelong is a favoured district. The rainfall ranges from 22 inches annually on the high volcanic plain to 25 inches in the Moriac and Buckley districts. The greater part of the land to the north and east is plain, liberally sprinkled with volcanic floaters and "stony rises." But the soil here is a retentive clay loam capable of growing good crops of wheat and barley, and is

unequalled for oaten hay. To the south and west—that is, nearer the sea coast—the land is more undulating, and consists mainly of sandy loam overlying clay. Here oats, barley, dun peas, and certain introduced grasses and clovers have been shown to thrive on what was once looked upon as merely grazing country. These elevated areas are intersected by the Barwon and Moorabool Rivers and their tributaries. Great valleys have thus been carved out. They contain rich flats and slopes. Their fertility has been largely contributed to by the volcanic soils eroded by the rivers, and by the extensive beds of limestone cut through.

Between the Barwon and the Moorabool lie the Barrabool Hills, with their rich chocolate volcanic soils, but they are a thing apart from the volcanic plains, as also are the friable black volcanic loams which fringe the sea coast in the Moolap district. It is on the Barrabool Hills, the river flats, and at Moolap and Moriac that the greatest agricultural development has taken place. These areas lend themselves to the more intensive type of agriculture, as does a considerable area of sandy land

A Seven-horse Team (Messrs. Leigh Bros., Marathon).

in the Wallington district, lying to the east of Moolap. In the latter area, market gardens and orchards do well, and general mixed farming is conducted.

Needless to say, some highly improved and soundly-managed farms were entered in the competition.

Awards.

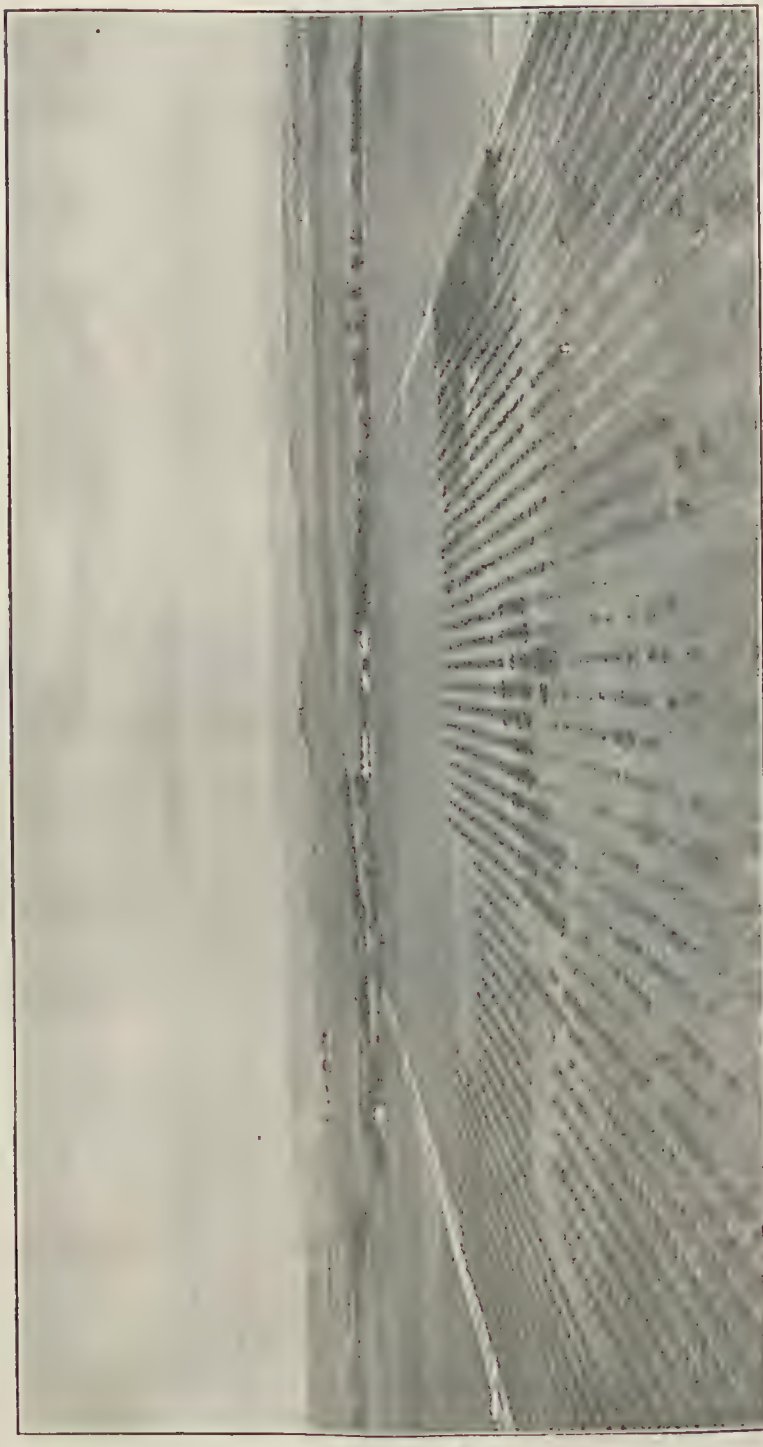
In Class A, Messrs. Leigh Brothers, "Roselea," Marathon, were placed first with 219 marks out of a possible 300, and Mr. S. J. Lugg, of Moolap, was second with 207 points.

In Class B, Mr. W. J. Muhlebach, Batesford, was first with 234 points, and Mr. D. O'Halloran, Moolap, 224 points, second.

In Class C, Mr. J. J. Baker, of Bannockburn, was awarded 217 points and first prize.

In Class D, Mr. O. A. Harding, Wallington, was first with 178 points, and Mr. G. W. Evans, Buckley, second, with 176.

Full details of the awards appear on pages 35 and 36.



Bird's eye View of the Winning Farm—Section B. (Orchard in foreground.)
Mr. W. J. Muhlebach's, Batesford.

The Competing Farms.

CLASS B.—FARMS WHOSE PRINCIPAL RESERVE IS DERIVED FROM CEREALS AND SHEEP.

Messrs. Leigh Brothers, the winners in Class A, have an attractively laid out and well-managed farm of 1,146 acres on the volcanic plain in the direction of Anakie. This farm was part of the old Marathon sheep station. The present owners acquired it at the original subdivision of this estate, and in a comparatively short space of time have effected numerous and substantial improvements. The house and garden are especially commendable. The stable is well built and provided with an automatic feeding device. The soil consists of black, grey, and chocolate clay loams, with patches of basalt stone. The rainfall in this district is 21 inches annually. The principal activities are wheat, oaten hay, and barley growing, combined with sheep raising.

A rotation system is practised in which fallow precedes wheat or oats for seed, followed by oaten hay or barley on the stubbles. A feature is the provision of autumn feed for sheep on the stubbles following the

Mr. S. J. Lugg's Border Leicester Stud.

hay and the barley. The stubble paddocks are disced up in the early autumn, and sown to Algerian oats for forage at the rate of 1¼ bushels per acre, with 60 lbs. superphosphate. Rape was tried, but it was not regularly successful. The yield of wheat obtained averages from 5 to 6 bags per acre. Federation is preferred, because it stands well the strong winds to which the locality is subject. Currawa and Major also do well. This year there are 10 acres sown to Pryor barley, 30 acres to wheat (Major and Federation), and 80 acres to Algerian oats. One hundred and twenty acres have been fallowed, and portion of last year's stubbles sown to forage oats.

The sheep at present being carried comprise 630 Comeback ewes and wethers and 280 lambs. The Comeback wethers were an especially good line of big-framed dense-woolled sheep. It is the practice to lamb down about 300 Comeback ewes mated with Border Leicester rams. Such of the lambs as can be fattened are weaned and sold, and any balance held over. In addition, a number of dry sheep of heavy-wool producing type are carried.

Messrs. Leigh Brothers, as was remarked last year, showed evidence of ingenuity in the making of home-made mechanical devices. Many of these were noticed. One was an efficient sparrow trap near the poultry run, another a wire in the stable at the rear of the stalls to facilitate the shifting of the hurricane lamp, another the automatic feeding chutes provided for feeding the horses in the stable, &c.

A feature of the farm was the water supply and general conveniences provided for the women folk in the shape of wash-house, cool cellar, dairy, &c., lighting system, piped water supply, &c., and its attractive environment.

Mr. S. J. Lugg, of "Iluka," Moolap, is at some disadvantage from a competition point of view, in that he farms a leased property. Nevertheless, he is developing it satisfactorily, and farms skilfully. The property consists of 330 acres of very rich, friable black volcanic soil, fringing the seashore at Moolap. Wheat, oats, and barley are the principal crops, but some onions, peas, rye, and silver beet forage are often

Heavy Crop of Dun Peas at Mr. W. J. Mahlebach's, Batesford.

grown. This year the acreage sown to barley has been considerably reduced because of the low prices obtained. In addition, a number of sheep are maintained, including a stud of Border Leicesters.

The area at present in corp comprises 55 acres of "shandy" hay, 10 acres oats, 54 acres wheat, 10 acres malting barley, 6 acres rye, 5 acres silver beet, 5 acres onions, and 1 acre of peas. In addition, there are 10 acres of oats for forage purposes, and 23 acres sown down to Wimmera rye-grass and Alsike clover, with a little wheat and rye as a cover crop. The general rotation system practised is barley, oats, barley, with an occasional change to wheat or a spell in grass. Little or no fallowing is done, but after the oaten hay is off, the land is ploughed as soon as possible and well tilled.

A motor tractor is used by Mr. Lugg to do the bulk of the cultivation work, and a combined spring-toothed cultivator drill is used to seed the crops. Formerly, when the land was spelled in grass, English rye was

used, but more recently it has been found that Wimmera rye-grass furnishes a greater bulk of feed, and it has been discovered that Alsike clover grows well. The soil and climate are well suited to barley, which yields on the average from eighteen to nineteen bags per acre. The Cape type is preferred, though a little Duckbill and Pryor are generally grown. Duckbill is not such a prolific barley as Pryor, but, according to Mr. Lugg, it does not "shake" so readily. For barley 1½ bushels per acre, with 100 lbs. superphosphate, is used; the middle of July is preferred for seeding it.

Oats yield on an average from sixteen to seventeen bags per acre, even though fed off to sheep up till the end of July. May sowing for oats is preferred, and 1½ bushels, with 60 lbs. superphosphate, is the seeding used. Some success has been obtained in the past with silver beet as a forage, but this year the "pea mite" has played havoc with the crop. Rye sown at rather less than a bushel per acre yields payable crops of grain and furnishes useful thatching straw.

Two of Mr. Muhlebach's Pedigree Ayrshires.

Under the continuous cropping system practised in the district, it is to be expected that certain weeds that appreciate the conditions would multiply and spread. Charlock and oxalis are two of these. Mr. Lugg has been combating them with some energy and success on his farm by a combination of early and thorough cultivation and late sowing.

The constant working of land infested with oxalis raises the bulbs to the surface whence they are picked up by birds. A barley crop sown in August suppresses the flowering of the plant and so helps to exhaust the remaining bulbs. In the case of charlock, Mr. Lugg finds it advisable to burn the stubbles of an infested crop, thereby destroying a large quantity of the seed, then he cultivates the young plants out as they grow. As the seed does not germinate until the early spring, late sowing must be practised.

These weeds, particularly charlock, are a serious pest in the Geelong district; they can be minimized by the above methods, but they can never be completely eradicated unless an occasional well-worked fallow

is included in the rotation system. Even then odd plants will appear in the crops, and these must be carefully hand-pulled and destroyed. Where patches are too thickly infested to pull, spraying with blue-stone solution may be used. This will cause the charlock to wilt, but does not hurt cereals. This method is used with success in the south of England.

Mr. Lugg has now used his tractor with complete success for several seasons. Its use has enabled him to dispense with all but four horses.

An interesting feature was a comprehensive series of experimental plots of oats and barley.

The pathways about the homestead and farmyard had been rendered most attractive by liberal applications of white shell grit, of which there are abundant supplies on the farm.

Dorset Horn Stud (Mr. W. J. Muhlebach's, Batesford).

Class B.—Large Farms Whose Principal Revenue is Derived from Live Stock, Orcharding, Etc.

The two competitors in this class entered the most highly improved and diversified farms in the contest. Both were among the competitors last year, when one of them, Mr. D. O'Halloran, was the winner. Increased interest was manifested this year because the judging was conducted under a modified scale of points, and because the competitors had each effected a number of improvements.

The winner this year was Mr. W. J. Muhlebach. His farm of 284 acres is most picturesquely situated on the rich Moorabool flats at Batesford, a few miles from Geelong. From the steep-terraced slopes a couple of hundred feet high, which form the northern boundary, a comprehensive view may be obtained. Immediately under the slopes are some 32 acres of orchard, comprising evenly-grown and regularly-planted apples, pears, and apricots. They stand out boldly against a background of perfectly-tilled soil. From either side of a substantially-fenced drive, paddocks of oats, barley, peas, pasture, and lucerne are laid off squarely,

and here and there groups of sleek dairy cattle and well-grown sheep may be seen. In the distance are grouped boldly-modelled farm buildings. The winding Moorabool, with its shady trees, flanks the whole of the southern boundary. Near the homestead is a further area planted in young trees.

Besides its profitable orchard, this farm has a noted herd of pedigreed Ayrshire dairy cattle, comprising at the present time eight pure-bred cows, six calves, and two bulls. The head of the stud is "Violet's King," a shapely animal with all the dairy points. He was second as a yearling at the Royal Show, and first as a two-year-old. Three of the cows, "Pansy's Queen," "Daisy Bell," and "Beauty's Queen," were prize winners at the last Royal Show. The cows are undergoing the Government herd test. They were in perfect condition, and are well housed in a 14-bail cowshed, 60 feet x 24 feet, with the bails in a single row. The floor is paved with brick, and well drained. The shed faces east, and is well ventilated. There is ample space behind the stalls for

Entrance to Springfield Avenue. (Second Prize Farm—Section B.)
Mr. D. O'Halloran's, Moolap.

storing feed, and a feed-mixing room is conveniently situated. An adequate supply of flushing water is available. The cows graze on the natural pastures, and in the autumn graze oats and barley forage specially grown for them. In the summer 25 acres of lucerne is available. There are now 32 acres under Wimmera rye-grass.

In addition to the dairy-herd, there is a new stud of Dorset Horn sheep, comprising eighteen head of these prolific animals, and some 300 Comeback sheep with lambs. There are also a few pedigreed Middle Yorkshire pigs.

Lucerne is sown on the land nearest the river—that is, on the portion most easily irrigated. The other crops sown this year comprise 61 acres of Algerian oats, 10 acres Pryor barley, 11½ acres dun peas, and Wimmera rye-grass pasture sown with oats for forage. The lucerne is the only crop regularly irrigated. This is done with water raised from the river by means of a powerful steam-engine operating 5 and 6 inch centrifugal pumps. The canvas hose system is used for conveying the water

to the lucerne. Some of the paddocks, though sown a number of years, looked very healthy. It is the practice to renovate them with a cultivator every autumn and to top-dress them with superphosphate.

Despite the high degree of specialization in the live stock, the principal source of "Retreat" revenue is the orchard. This is laid out on good loamy land, but by no means the richest on the property. The two blocks comprise 36 acres in all. There are 2 acres of pears, "Ironbark," Prince William, and Packham's Triumph; 3 acres of Apricots, of which Mansfield's Seedlings do best, and 2 acres of plums. The balance consists of apples, mainly Jonathan, but there are also Delicious, Cleopatra, Rome Beauty, &c. The trees in the orchard are very regularly developed and shapely. Careful attention is given to intertillage, to pruning, to manuring, and the provision of cross-fertilizers for the apples. In the autumn of each year a barley-oat mixture is sown between the trees and fed off to sheep. The residue is ploughed under. A detailed description of the management of this orchard was included in the report last year. The yield is from 4,000 to 6,000 cases a year. The planting is on the basis of 100 trees per acre.

Last year a comprehensive water supply system was installed, by which river water is pumped by a windmill to each paddock not served by the river. In fourteen paddocks substantial concrete troughs with ball-cock have been provided at a cost of about £4 each. Each trough is solidly set in concrete on blue-stone spalls. The total cost of the installation was about £300, including the mill and piping.

The homestead is a substantially built one, well-provided with modern labour-saving devices. A feature of the farm buildings is a large barn with capacious underground cellar accommodation.

A number of the crops shown were exceedingly heavy. Notable among them was the crop of dun peas. These were tall, and yet so densely packed and evenly grown that the tops of the plants appeared matted together. Mr. Muhlebach sows peas at the rate of 3 bushels per acre.

Three excellent paddocks of Wimmera Rye-grass were seen. One had been sown three years and had re-seeded itself most satisfactorily.

Mr. D. O'Halloran's farm, "Springfield Avenue," was only ten points behind the winner. As has been explained, it was awarded the first prize last year under another scale of points.

The property and Mr. O'Halloran's methods were described in detail last year. The farm comprises 449 acres of undulating country at Moolap, on the shores of Reedy Lake. The soil is a good quality sandy loam of dark colour. The owner specializes in dealing in dairy cattle. His practice is to buy the cows and then bring them into profit on his own farm before re-selling them. Besides that, he maintains a small permanent dairy herd of grade cows. The whole farm—its layout, subdivision, and the system under which it is being farmed—is organized for the particular business of the owner. There are 26 small paddocks, no one of which is greater than 36 acres. Great care has been taken in laying them out to have them accessible to each other, to water, to the farm yard, and to the drafting pens.

A cropping system has been devised which provides for ample areas of luscious pasture, sown of a mixture designed to be productive for a longer period than usual. This is done by sowing down a liberal dressing of English rye-grass with an admixture of lucerne. The

pastures are regularly top-dressed. A feature of the place is the magnificently-grown plantations of trees and hedges (kept well trimmed) which form extensive shelter belts about the paddocks, often completely enclosing them. The homestead is reached at the end of a long avenue of massive pines and well-grown sugar gums. From here the land slopes gently away on all points of the compass, and a view is commanded of nearly every paddock. The accessibility of the paddocks to each other and to the farm-yard has been carefully planned. The entire fencing is of a most substantial order. There are some 50 wooden gates of the type illustrated below.

The following areas of crop were sown this year:—Oats for hay 45 acres, Warden wheat 18 acres, Major wheat 17 acres, Pryor barley 32 acres. There are in addition 90 acres sown to pasture. Lucerne at the rate of 4 lbs. per acre is sown in the spring, sometimes with a crop of late-sown barley. In the following autumn, English rye-grass at the rate of a bushel per acre is harrowed in on top of the lucerne.

One of the Fifty Wooden Gates on Mr. O'Halloran's Farm.

Attention has been paid to top-dressing the land. In all some 380 acres have received a heavy dressing of decomposing shells at the rate of from 30 to 40 loads to the acre. A deposit of the shells occurs in the vicinity. In addition some 100 acres of pasture have been top-dressed with superphosphate.

The property is at present carrying 90 head of cattle, 30 sheep, and 11 horses, as well as a few pigs. The horses were a particularly fine stamp and were awarded highest points in the competition.

CLASS C—(MIXED FARMS LESS THAN 100 ACRES.)

Although there was only one farm entered in this section, it was of exceptional merit. Situated on the fertile flats of the Moorabool at Bannockburn, it is a striking illustration of what can be done on 91 acres where industry and intelligence are applied to farming.

On this farm the whole of the produce raised, with the exception of an acre or two of culinary peas, is fed to live stock on the farm.

The breeding of pedigreed Middle Yorkshire pigs is specialized in, but in addition there is a herd of dairy cows. Mr. Baker has won a leading position as a breeder of pigs. The stud is founded on the Preston Peter-Warrigul Rosette blood. The progeny of these pigs have secured four championships in the Royal Shows at Melbourne and Sydney, also two reserve championships. The prizes secured at the Royal Show last year comprise first for boar nine months, also four-months first and second. A number of prizes were also secured for young sows, including first in the four-months class. In fact, practically the whole of the prizes in the Middle York section were awarded to pigs bred from this strain of blood.

In all, from eight to twelve breeding sows are kept, and from 30 to 50 stud pigs. The usual practice is to grow 25 acres of English barley for the pigs. Cape gives heavier yields, but the husks are found to sometimes interfere with the breathing of the pigs—a detriment in the show ring. The grain is crushed, moistened with boiling water,

Some of Mr. O'Halloran's Splendid Draught Horses.

mixed with skim milk and fed while still warm. The young pigs are weaned at eight weeks; they are from that time fed on the barley and milk ration. Wheat, maize, and peas have all been tested at times, and wheat is preferred as a food if it can be bought at satisfactory prices. Any young pigs that may scour are allowed to run at grass. This is found to effect a rapid cure. Ashes from the copper are placed in each pen for health purposes, and lucerne hay is fed to some extent. Barley straw is used for bedding the pigs down. When incorporated with the urine and dung it is carefully preserved in a closely packed heap for use in improving the stiffer soils on the farm.

Twenty-one acres of river flats are maintained under lucerne, which is irrigated by means of a motor engine and centrifugal pump. The lucerne is kept in first-class condition by renovation and top-dressing.

Superphosphate at the rate of 2 cwt. per acre is applied every second year.

Forage crops of oats and barley are sown for cow-feed after the first autumn rains. The herd grazes these crops in the winter, and has access to the lucerne for short periods, and to some natural pasture on the banks of the river. The homestead is a comfortable one, the buildings are compactly arranged and the property is well subdivided. Mr. Baker has erected some 200 reinforced concrete posts of his own manufacture. These are made in his spare time at a cost of 1s. 3d. per post for material. They are everlasting and make a most handsome fence. Softwood moulds are filled with fairly wet concrete made of one part cement, two parts sand, and three parts gravel. Iron pegs are placed in any positions where holes for wires are desired. The posts are reinforced with ten pieces of hoop-iron (from cornsack bales). The lower section of the post has double as much reinforcement as the upper. The dimensions of the posts are 6 inches x 3 inches x 3¼

Dairy Herd of Mr. J. J. Baker, Bannockburn.

inches. The extra quarter of an inch at the back of the post insures their tipping out of the moulds readily. The posts are stacked to season for a month or two before being used, which adds considerably to their strength. Since last year a new stable has been erected, and further improvements are to follow.

Class D—Repatriated Soldiers.

The farms of the three competitors in this class are each worthy of commendation. In a few years each has developed his farm to an astonishing degree. The winner, Mr. O. A. Harding, has 120 acres of sandy loam at Wallington. He has been in possession of the property for two years and nine months. During that time a young orchard 20 acres in extent has been planted, the property subdivided, and a comfortable residence, as well as some substantial outbuildings have been erected. The orchard, which will be the principal activity when it comes into bearing, contains apricots, plums, pears, and peaches.

It has been carefully planted and well managed by the owner, who comes from a family of orchardists. Provision for shelter for the orchard and homestead has not been omitted, 40 to 50 chains length of *pinus insignis* in all having been planted for that purpose. The trees are doing well, and should soon afford valuable protection.

Cash returns are being obtained for the present from a herd of dairy cows which includes seven milkers and three springers; also from oaten hay and potatoes. This year there are 30 acres of oats, which should yield not less than 2½ tons per acre, and 3 acres of potatoes.

Mr. G. W. Evans has 322 acres at Buckley. He has been energetically clearing the block and now has it in good order. Wheat, oats, barley, and peas are the crops depended upon. Advantage is taken of the fact that forages such as rape and millet do well. Areas of these have been sown for sheep-feed. There are also 3 acres of lucerne and half an acre of mangels.

Heavy Crop of English Barley at the Farm of Mr. L. C. Kelly, Anakie.

The farming is being conducted under a satisfactory rotation system, which includes fallow, wheat, oaten hay, peas, and forage crops. Some of the soil is first-class black volcanic loam, and on this the crops are excellent. In some low-lying areas they have been water-logged, but the general average of the yields will be good. The following areas of crops have been sown this year:—Algerian oats 60 acres, field peas 20 acres, wheat 10 acres, barley 15 acres, rape 30 acres, Japanese millet 2 acres, lucerne 3 acres, mangels half an acre. In addition there are 40 acres of fallow, and some 12 acres of grass has been top-dressed.

Mr. Evans also deals in pigs, of which there were eleven on hand at the time of inspection. The pigs are fed on crushed grain grown on the place. This is fed to them in a dry condition with satisfactory results. In addition, from time to time they will get lucerne, mangels, and ironbark pumpkins.

In growing peas Mr. Evans adopts the Romsey practice of rolling them when a few inches high, and then he harrows them. This is found to increase the stooling.

On this farm there is also a flock of 70 sheep. A considerable amount of subdivisional fencing has been erected, and attention has been paid to water supply.

Mr. L. C. Kelly has a well-balanced, if somewhat scattered property at Anakie. It consists in part of rather stiff volcanic soil on the high land, part fertile chocolate soil on the slopes of Sutherland's Creek, and part of light soil on the east side of the creek. A neat homestead has been erected in a central and sheltered position in a bend of the creek. The position of the homestead in relation to the creek and general water catchment is such that for a small outlay a considerable quantity of water might be impounded—sufficient at any rate to provide a few acres of lucerne and other forage crops, and a small orchard.

The property comprises 312 acres, and, in addition, 78 acres are being farmed on the share system. Two hundred and two acres were under crop this year, including 165 acres Algerian oats, 17 acres malting barley (Pryor), and 20 acres of Major wheat. In addition, 76 acres have been fallowed. Most of these crops were heavy, but in the oats a considerable admixture of barley was noticed—a fault indeed common to the whole district. This, of course, does not interfere much with the oats as a hay crop, though when fed to farm horses it tends to foul the land with barley but it is undesirable in seed oats intended for grain. The trouble could be overcome if the system of preceding the oaten hay crop by a fallow were adopted. In this district it would be found to pay.

General Comments.

In last year's report a detailed account was given of drainage problems at Geelong, the growing of subterranean clover and dun peas, to which the moister parts of the district are well suited. The tillage of the friable black soils at Moolap was also discussed.

It is not proposed to repeat any of these remarks, except to say that farmers who have suitable soils at Geelong are neglecting a profitable crop, and one which is of considerable benefit as a soil renovator, if they do not grow some field peas in the rotation. For a number of years the price has been a very payable one, and there is now little difficulty in harvesting the crop. Subterranean clover does well over the moister parts of the district, and will pay to plant extensively on land intended for pasture, especially if an occasional dressing of superphosphate can be applied.

It has been shown that Wimmera rye-grass thrives well. It gives a sole of feed the first year equalled by no other grass, and at Geelong it has re-established itself in succeeding years satisfactorily. Senator Guthrie is one of those who have had success with it, so also has Mr. W. J. Muhlebach, to mention just two of the number who find it a good feed for stock.

In conclusion, I desire to tender my best thanks to the President, Mr. Ham, the Secretary, Mr. S. O. McIntyre, and to those members of the society who co-operated in making the judging time both interesting and pleasurable.

DETAILS OF AWARDS.

Section A—Large Cereal Farms.

	Farm Methods Management.	Growing Crops.	Pasture.	Horses.	Sheep.	Cattle.	Pigs.	Poultry.	Plant and Implements.	Fences and Stockyards.	Orchard and Vegetable Garden.	Water Supply.	Fodder Reserves.	Tree Planting.	Insurance.	Residence.	Out Buildings.	Total Points.
Possible Points	**40**	**35**	**15**	**25**	**20**	**5**	**5**	**5**	**20**	**20**	**10**	**30**	**20**	**10**	**5**	**20**	**15**	**300**
Leigh Bros.	35	20	9	20	16	3	4	4	11	15	6	20	18	8	3	17	10	219
S. J. Lugg	32	24	12	16	16	3	4	3	15	13	4	20	15	5	3	13	9	207

Section B—Large Live-stock Farms.

	Farm Methods Management.	Forage Crops.	Other Crops.	Pasture.	Horses.	Sheep.	Cattle.	Pigs.	Poultry.	Plant and Implements.	Fences, &c.	Orchard.	Vegetable Garden.	Water Supply.	Fodder Reserves.	Tree Planting.	Insurance.	Residence.	Out Buildings.	Total Points.
Possible Points ..	**40**	**15**	**10**	**20**	**15**	**10**	**25**	**15**	**5**	**10**	**20**	**10**	**5**	**30**	**20**	**10**	**5**	**20**	**15**	**300**
W. J. Muhlebach	35	13	6	13	9	8	20	11	3	8	12	10	4	30	16	4	3	17	12	234
D. O'Halloran ..	35	8	8	19	13	5	16	10	3	5	14	5	5	24	14	9	3	17	11	224

Section C—Small Mixed Farms.

J. J. Baker ..	36	12	6	14	11	6	22	15	9	8	13	5	4	25	6	4	3	16	10	225

Section D—Repatriated Soldiers.

	Farm Methods Management.	Crops and Sown Grasses.	Fallow.	Horses.	Sheep.	Cattle.	Pigs.	Poultry.	Plant and Implements.	Fences, Stockyards, &c.	Orchard and Vegetable Garden.	Water Storage.	Fodder Reserves.	Tree Planting.	Insurance.	Buildings and Outbuildings.	Total Points.
Possible Points ..	35	20	15	25	20	25	15	10	20	20	10	20	20	15	5	25	300
O. A. Harding ..	29	15	0	10	0	17	10	7	10	15	9	9	9	15	3	20	178
G. W. Evans ..	29	17	9	12	12	0	12	7	13	14	3	13	12	7	3	13	176
L. C. Kelly ..	26	13	7	15	0	12	0	5	15	12	6	9	13	4	3	20	160

IRRIGATION EXPERIMENTS AT WERRIBEE.

L. C. Bartels, B.Ag.Sc., Science Field Officer, Werribee.

Irrigation farming is of ever-increasing importance in Victoria, and in the future most of the water now running to waste in our rivers will be impounded to serve large areas of land which need only moisture to make them productive. Eventually, development of irrigable land will be restricted by a shortage of water; already in some irrigation districts, this is evidenced.

The value of investigations to show the relationship between water and yield is manifest, and unfortunately in this State there is an absence of reliable data. The different ideas held and the various methods adopted show the need for information which will guide the irrigationist in an efficient use of water.

Under irrigation conditions watering is an intermittent practice, and therefore it is desirable to ascertain at what intervals to apply water, and the quantities that will give the best results.

In order to investigate the problems connected with lucerne culture, a 10-acre field at the State Research Farm, Werribee, was in 1919 sown with plots of lucerne.

Ten quarter-acre bays, each 5 chains x ½ chain, were reserved for irrigation investigations. The irrigation field was prepared on the border system, with checkbanks 33 feet apart. On each bank a plot 6 ft. 5 in. wide was sown, and three plots of the same width were sown in each bay—so that the spaces between the edges of the plots were 1 ft. 10 in.

The checkbank plots act as buffer plots between the bays, and the produce from them is not weighed. Of the three plots in each bay, the centre plot receives no manure, while one is top-dressed annually with superphosphate at the rate of 2 cwt., and the other with ground rock phosphate (1 cwt. p.a.).

The scheme of waterings was adopted to test the effect of using different quantities of water, and the relative value of light and heavy irrigation when a limited quantity of water is at the disposal of the farmer, and the returns from the several plots, is shown in Table I.

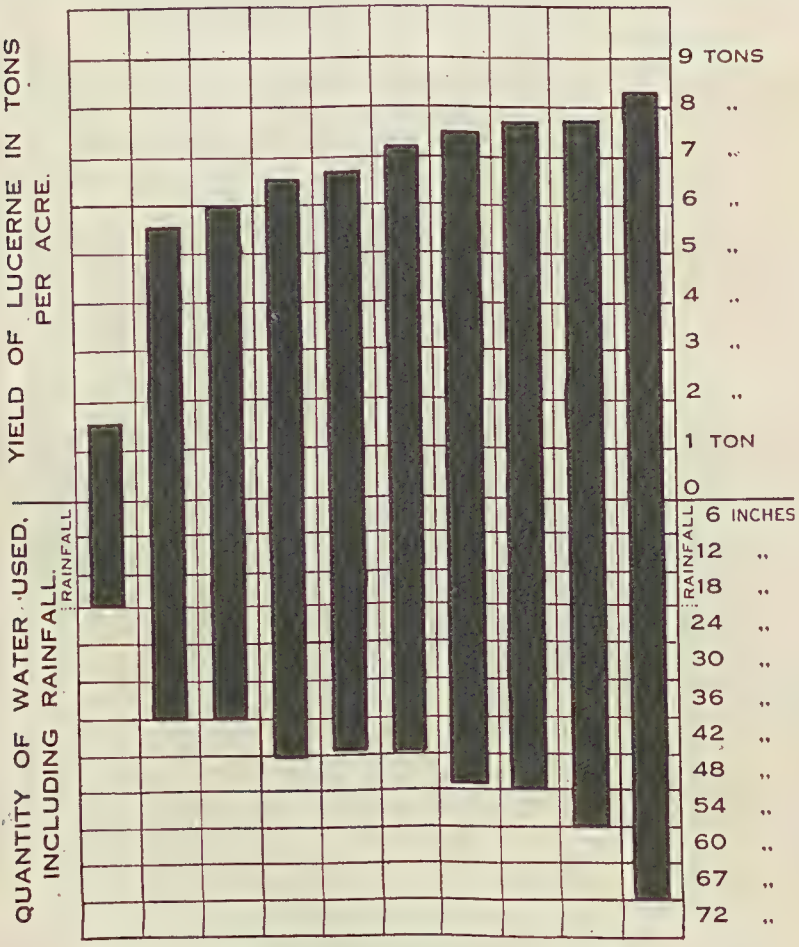
Concrete water channels were constructed to obviate seepage losses and to permit the accurate measurement of the water applied, and special water-measuring devices—sensitive Dethridge meters—were installed.

In the first season—1920-21—a modified scheme of watering had to be adopted, because the channels were not completed in time to permit the full programme being followed, and the first irrigation was not given till after the second cut was made. During the 1921-22 and 1922-23 seasons the proposed schedule of waterings was carried out. The main difficulty encountered was in regard to the heavier waterings of 5 and 6 inches.

It should be explained in this connexion that the soil in the experimental field is a clay loam, and the subsoil to a depth of 2 ft. 6 in. is fairly heavy. At that depth it is succeeded by a more porous stratum, but the surface condition makes the absorption of water slow.

TABLE I.—RATE AND FREQUENCY OF IRRIGATION—AVERAGE RESULTS FOR TWO SEASONS.

Bay.	Yield, 1922–23.	Yield, 1921–22.	Average of Two Seasons.
	Cwt.	Cwt.	Cwt.
1. Six applications of 3 inches	118·3	121·6	120·0
2. Three applications of 6 inches	105·8	116·3	111·0
3. Six applications of 4 inches	141·6	142·0	141·8
4. Four applications of 6 inches	131·4	137·25	134·4
5. Eight applications of 3 inches	127·8	130·7	129·3
6. No irrigation	23·6	35·8	29·7
7. Five applications of 6 inches	147·0	150·3	148·6
8. Six applications of 5 inches	155·1	152·15	153·6
9. Six applications of 6 inches	143·8	162·4	153·1
10. Eight applications of 6 inches	159·9	171·1	165·5



Graph Showing Relation Between Water and Yield. (Ranged in order of increasing yield.)

During the three seasons, the plots receiving no irrigation water stood in marked contrast to the others, but all reflected the varying treatment. Besides the differences in yield, there was a marked difference in the quality of the hay produced on the different bays. The heavily-watered plots bore a rank straggling growth, while on the plots receiving the lesser quantities of water, the lucerne was in some cases stunted, and growth was retarded by lack of moisture.

Samples of the hay produced at each cut were taken at weighing time to determine the moisture, so that adjustments might be made and all the yields computed on a basis of a 15 per cent. moisture content.

There was increased production as the amount of irrigation water was increased, but it was not proportional to the added amounts of water. This is best illustrated by showing the returns from the several bays for the different instalments of water added, and it is a good example of the law of Diminishing Returns.

TABLE II.—INCREASE IN PRODUCTION DUE TO IRRIGATION.

Water.	Yields of Hay per Annum. (Average of two seasons.)	Increased Yield due to Irrigation.
	Cwt.	Cwt.
Rainfall only (17·95)	29·7	—
Rain + 18 in. irrigation water	120·0	90·3
Rain + 24 in. irrigation water	141·8	112·1
Rain + 30 in. irrigation water	153·6	123·9
Rain + 36 in. irrigation water	153·1	123·4
Rain + 48 in. irrigation water	165·5	135·8

The first 18 inches, in addition to rainfall, produced an increased yield of 90.3 cwt.; the second 18 inches only 33.1 cwt. Twenty-four inches of irrigation water increased the yield by 112.1 cwt.; an additional 24 inches of water gave a further yield of 23.7 cwt.

The yields from the three plots in each bay are averaged for purposes of comparison, and the increased water cost of the hay from the different bays, as heavier yields are induced by increased irrigation, is shown in Table III., expressed in inches of water per ton of hay. Similarly, the yield per acre-inch of water shows a successively increasing return from the lighter to the heavier waterings.

An analysis of the figures given in Table III. and a comparison of the results obtained during the two years is interesting. It must be remembered that the irrigation water is supplemental to the rainfall, and the efficiency of the rainfall depends not only on the quantity which falls, but on the time at which it falls. Obviously, heavy winter rains, which occur during the dormant period of the plants, will not promote abundant growth, and their value will depend on how much remains stored in the soil to become available when the warmth of spring and summer awakens the plant to new life. This function of the soil as a reservoir for moisture is an important one. The soil moisture film in intimate contact with the soil particles for a relatively long period becomes charged with plant nutrients, but often this moisture is held tightly by the soil particles, and only when

summer rain or irrigation is received in sufficient quantity to thicken the film is the plant able to make use of it. For somewhat obscure reasons, the soil moisture film is more highly charged near the surface of the soil particles, and this is one reason why transpiration of moisture from a plant in a wet soil is higher while it is not accompanied by the same growth as a similar amount of transpired water would induce when a plant is growing in a soil of medium saturation.

TABLE III.—SHOWING THE VARYING EFFICIENCY OF WATER IN THE PRODUCTION OF LUCERNE HAY UNDER DIFFERENT RATES OF IRRIGATION.

Plots (in Order of Productiveness).	Water—Rain + Irrigation.	Yield of Hay Produced, (15 per cent. Moist.)	Quantity of Water used to Produce One Ton.	Amount of Hay Produced by One Inch of Water.
	Inches.	Tons.	Inches.	Ton.
Season 1921-22.				
Six 4-in. waterings	43·26	7·1	6·09	·164
Six 3-in. waterings	37·26	6·08	6·13	·163
Four 6-in. waterings	43·16	6·9	6·29	·159
Three 6-in. waterings	37·26	5·8	6·40	·156
Six 5-in. waterings	49·26	7·6	6·48	·154
Five 6-in. waterings	49·36	7·5	6·56	·152
Eight 3-in. waterings	43·36	6·5	6·63	·150
Six 6-in. waterings	55·26	8·1	6·80	·147
Eight 6-in. waterings	68·16	8·5	8·05	·124
Rainfall only	19·26	1·8	10·7	·093
Season 1922-23.				
Six 4-in. waterings	40·63	7·08	5·74	·174
Six 3-in. waterings	34·63	5·91	5·85	·170
Six 5-in. waterings	46·63	7·75	6·02	·166
Four 6-in. waterings	40·63	6·6	6·18	·161
Five 6-in. waterings	46·43	7·35	6·32	·158
Eight 3-in. waterings	40·93	6·4	6·40	·156
Three 6-in. waterings	34·63	5·3	6·55	·152
Six 6-in. waterings	52·23	7·2	7·26	·137
Eight 6-in. waterings	63·23	8·0	7·91	·126
Rainfall only	16·63	1·2	14·1	·071

Averaging the results of the two seasons under review, every inch of water received by the lucerne on the bay given six 4-inch waterings produced .169 tons of hay; an inch of water on the bay receiving eight 6-inch waterings produced only .125 tons.

What has been called the evapo-transpiration ratio of plants is the proportion between water used by the plant and lost by evaporation and the dry matter produced. The yields of hay have been computed on a 15 per cent. moisture basis, and thus the transpiration ratios of the hay produced on the two bays cited above are respectively 703 and 950. These figures are a measure of the enormous amount of water used in lucerne growth. For every ton of dry matter in the lucerne at least 703 tons of water passed through the plant. They show, too, that the plant is wasteful of water when it is abundant.

The amounts and succession of rainfall, temperature, sunlight, and wind, and their varying combinations make up the season which governs plant growth. In the aggregate the yields of lucerne in two succeeding seasons have been remarkably even, although the differences in conditions have been reflected in heavier or lighter cuts at the same stages of the two seasons, and it is obvious that the less frequent waterings such as three or four of 6 inches each, which are not sufficiently frequent to induce regular growth, will have an increased efficiency if the incidence of the rain is such as to maintain a moist condition in the soil between irrigations, or if warmth and sunlight prevail when moisture is available. This is suggested as a possible reason for the variations in results in the two seasons, but the crops in succeeding years have complex relations to the soil, to preceding crops, and the cumulative effects of irrigation and fertilizers; thus only a general agreement may be expected from year to year.

The growth of lucerne on the " No Irrigation Bay " was governed by the amount of rain falling during the growing period. There was a marked difference in the yield during the three seasons, partly because the distribution of the rainfall varied; and although this plot makes no growth during the dry part of the season, it presents the densest stand of all the bays during the winter and spring.

During the three seasons the application of 18 inches of irrigation water has been insufficient for full development of the crop, and although when applied in six lots of 3 inches each, a fairly uniform growth was maintained, the lucerne generally bore the dark-green appearance which indicates lack of moisture.

It may be stated that at least 24 inches of water in addition to the average rainfall is needed to maintain favorable moisture conditions for lucerne. But even that amount does not set a limit to profitable irrigation. Moreover, the efficacy of 24 inches of water varies according to the manner in which it is applied.

Six applications of 4 inches produced a bigger yield than four 6-inch or eight 3-inch waterings. The four waterings, although relatively heavy, were not sufficiently frequent to maintain even growth. The soil moisture became so far reduced between irrigations that growth was interrupted; on the other hand, eight 3-inch waterings, while maintaining a more even condition in the soil, kept the surface only in a moist condition—leading to greater loss by evaporation. Further, the water was used up rapidly by the plant, and did not remain long enough for the plant food to be dissolved and properly distributed.

When 30 inches of irrigation water is applied there is not much difference between the results from those of five 6-inch or six 5-inch waterings. In either case the moisture penetrates to a fair depth and is stored in the soil.

The heavier waterings—six and eight of 6 inches each—gave increased yields. These plots showed to advantage when growth was most rapid, but it has been shown that the use of so much water is uneconomical.

The question presents itself—What would be the productive value of a given quantity of water if used on a small area, as compared with its value when spread over a larger area? Would it be more profitable to use 60 acre-feet of water in irrigating 15 acres of a 40-acre block or in irrigating the whole 40 acres?

Based on the results given above, the comparative returns would be as shown in Table IV.

TABLE IV.—COMPARATIVE RETURNS FROM A VARYING QUANTITY OF WATER OVER VARYING AREAS.

Irrigation per Acre.	Area Irrigated.	Yield per Acre.	Yield from Irrigated Area.	Additional Yield from Unirrigated Area.	Total Production.
	Acres.	Tons.	Tons.	Tons.	Tons.
18 inches, in six applications of 3 inches	40	6·0	240·0	..	240·0
24 inches, in six applications of 4 inches	30	7·09	212·7	14·8	227·5
30 inches, in six applications of 5 inches	24	7·68	184·3	23·8	208·1
36 inches, in six applications of 6 inches	20	7·66	153·2	29·7	182·9
48 inches, in eight applications of 6 inches	15	8·27	124·0	37·0	161·0

Conclusion.

The growing importance of irrigation warrants the most complete investigations of the relations between soils, moisture, and crops, particularly under field conditions.

The plots established at Werribee in 1919 have provided interesting information on the action of water. Varying quantities of irrigation water up to 4 feet per acre have induced increasing yields, but the return for each unit of water became successively smaller, and the worth of these augmented yields is found to be smaller because analyses of the hay showed a lower protein content in the heavily watered crop.

The water-cost of the dry matter in lucerne is very high—on the irrigated plots it ranged from 703 to 950 tons of water for every ton of dry matter produced.

Best results were obtained by the application of from 24 to 30 inches of irrigation water, and applications of at least 4 inches seem desirable.

A steady growth of the lucerne should be maintained, but the amount of growth is determined by many factors, including the ease with which the plant takes up the soil moisture. If the percentage of soil moisture is small, the plant has to expend too much energy in obtaining it; if it is great, the plant uses it more or less wastefully.

When the amount of irrigation water available is limited, it is more productive if spread over a larger area than if used in heavy applications on a smaller area.

Obviously, the amount of labour and time which a farmer has at his disposal are factors which must be considered when seeking to establish an economical system, but as irrigation farming increases, limitation will be set by the amount of water available, and its profitable use will be of first importance.

FARMERS' FIELD DAY.

LONGERENONG AGRICULTURAL COLLEGE.

(From the *Wimmera Star.*)

The tenth annual farmers' field day was held at the Longerenong College on Saturday, December 8. Motor cars were seen speeding to the college from all directions. There were over 400 farmers present from all parts of the Wimmera. Parties were there from Donald, Rupanyup, Marnoo, Galaquil, Rainbow, Nhill, Dimboola, Goroke, Noradjuha, Minyip, and Harrow, and a large contingent of local farmers were also in attendance. The assemblage of motor cars parked near the experimental plots was a striking manifestation of the abounding prosperity of the Wimmera Province. The visitors were met by the principal of the college (Mr. A. C. Drevermann) who welcomed them to the college and introduced Mr. A. E. V. Richardson, M.A., B.Sc., Agricultural Superintendent of the Department of Agriculture, who, in a brief address, explained the objects of the plots and the main results since their inauguration.

Mr. Richardson said that the large gathering assembled was in striking contrast to the first field day held ten years ago, when some 50 farmers, who came on horses, jinkers and bicycles, attended. To-day over 400 farmers were present, and practically all came in motor cars. A great development had taken place in Wimmera methods of farming during the past twelve years, the date on which experimental plots at the college were established. Individual farmers were reaping bags per acre where they formerly obtained bushels. During the past 20 years the average yield of Borung had increased from 8 bushels to 25 bushels, and at the same time land had increased in value from £5 to £25 per acre. This striking advance in yield been brought about by the application of the results of experimental work to wheat cultivation. The application of superphosphate had probably resulted in an increased yield of two bags per acre, representing an increase of 1,000,000 bags per annum over the whole Wimmera province. The introduction of thorough methods of fallowing, which imply the working of the fallows systematically throughout the spring and summer when necessary, had probably added a larger amount still. This was strikingly shown in the average returns for the past five years from the permanent rotation plots. Wheat continuously cropped averaged about 11 bushels per acre whereas wheat grown, after a well worked fallow, with oats included in the rotation, a common practice in the Wimmera, averaged not less than 35 bushels per acre. The distribution of select-bred graded seed, amounting to 12,000 to 14,000 bushels per annum from the college farm, has had a profound influence in further increasing the wheat yields of the Wimmera province. Federation wheat, which has proved to be the most popular and prolific wheat variety for the Wimmera, has not only been maintained at a high standard, but its prolificness has been materially increased by continuous and systematic selection. Other varieties have been worked up on similar lines and distributed to farmers, and in all cases the initial selection was a single highly reproductive plant of the best type. All seed distributed from the college has not only been carefully and systematically selected to maintain and increase its prolificness, but it has also been carefully graded. This.

of course, entails extra handling and close attention. Experiments conducted for the past seven years on the plots have shown that late seeding results in a material increase in the grain yield.

The late sowing of six representative varieties of wheat over a period of seven years gave a 5-bushel increase over early sowing of the same varieties. This indicates how another 1,000,000 bags of wheat may be added to the production of this great wheat province. The original intention of late sowing was to overcome the weeds, but in point of fact, the improvement in yield was due mainly to the increased proportion of grain to straw in the late-sown crops. This was shown by actual tests made with six varieties of wheat.

The average results for early and late sowing for the past seven years were as follows:—

	Early Sowing.	Late Sowing.
Kings Early	29.0	33.9
Bunyip	25.4	33.0
Federation	38.1	42.8
Yandilla King	34.7	38.5
Marshalls No. 3	30.8	34.6
Darts Imperial	31.2	35.2
Average	31.5	36.3

Even though great advancement has been made during the past decade in wheat production still further progress was inevitable. Further development would result from increased dressing of superphosphate, improvements in cultural methods, and the production of new and improved varieties of wheat. Liberal dressings of superphosphate had paid handsomely on the experimental plots. The results for eleven years worked out as follow:—

Treatment.	Yield per acre.	Increase over Unmanured Plot.	Value of increase at 5s. per bushel.	Net Profit over Unmanured Plot.
Super ½ cwt. ...	33.9	4.2	21 0	18 0
Super 1 cwt. ...	35.1	5.4	27 0	21 0
Super 2 cwt. N ...	37.2	7.5	37 6	25 6

A liberal dressing of 2 cwt. per acre had over a period of eleven years given 7.5 bushels increase over the unmanured plot, and 3.3 bushels over the ½-cwt. plot. It was therefore clear that through the medium of heavier manurial applications growers in the Wimmera could still further augment wheat yields and incidentally their bank accounts. Liberal dressings of fertilizer were of especial value where cultural methods were thorough.

Summer fallowing was becoming increasingly popular in the Wimmera. Ten years ago this practice was hardly known there; to-day probably one-half of the fallowed land was worked up in the summer months. This was a most important cultural development, and its practice had led to a material increase in Wimmera yields during the past few years. The loose summer fallow was ideally suited to absorb the whole of the winter rains. There was practically no run off, and all the winter rain was impounded and conserved in the subsoil. By judicious working of the surface of these fallows during the following summer practically the whole of the moisture stored in the soil was carried forward for the use of the wheat crop.

The practice of summer fallowing not only led to clean farming, increased conservation of soil moisture, increased bacterial activity, but had the important economic advantage of distributing labour, both team and man labour, evenly throughout the year.

Finally the production of new high yielding wheat varieties had been placed on a sound scientific foundation by the recent application of the discoveries of Mendel and his followers. To-day nearly the whole of the wheat varieties grown in the wheat belt were of crossbred origin and the production of Australian wheat-breeders. To William Farrer, the father of Federation, the Wimmera farmers owed a great debt of gratitude.

Farrer was Australia's pioneer wheat breeder and wheat specialist, and his masterly achievement in producing that well-known variety has led to such an increase in production and has given such widespread benefits that it has already more than paid the whole cost of all the agricultural education and all the agricultural research work in the Commonwealth.

Mr. Richardson dealt with the Mendelian theory as applied to wheat breeding. His remarks were illustrated by exhibits on a blackboard showing the inevitability of the law.

The plots of wheat were then inspected, and as the visitors went along the lecturer explained the results attained.

A large number of new crossbred wheats were undergoing trial in test plots and some of these gave promise of supplanting existing varieties in cultivation.

A field of Federation wheat, 200 acres in extent, was inspected. It was estimated that it would yield 42 bushels to the acre, and was a remarkably fine example of a crop of wheat grown equally well all through, very thick, and affording a capital illustration of the fact that the theories and principles taught at the college stood the test of a practicall illustration.

Mr. Richardson brought the farmers to a permanent rotation field, where the results of five years of experiment were demonstrated. In this field 23 plots of half an acre each are being used for testing eight different systems of rotation. The treatment was indicated on labels in front of each plot.

There were seven series as follows:—

A. Wheat continuously. B. Wheat after bare fallow. C. Mallee rotation—wheat, pasture, bare fallow. D. Wheat after peas and barley. E. Wheat, oats, peas. F. Wheat, oats, bare fallow. G. Wheat, oats, pasture, bare fallow, and H. Wheat, rape, barley, peas.

The average results for five years was as follows:—

Wheat, oats, pasture, bare fallow, 35 bushels 14 lbs.; wheat, bare fallow, oats, 24 bushels 48 lbs.; wheat, pasture, bare fallow, 34 bushels 36 lbs.; wheat and bare fallow alternately averaged 32 bushels 19 lbs., and wheat continuously, 11 bushels 3 lbs.

Afternoon tea was served in the new class-room, a spacious well-lighted apartment which proved large enough to accommodate the 400 farmers who accepted Mr. Dreverman's hospitality, and the students who waited on the guests had a busy time. The principal gave a cordial welcome to the visitors, who he said were welcome at the college at any time. The institution was established to teach students in agriculture and to exercise an influence over the farmers of Victoria. Mr. W. Sproat, president of the Donald Agricultural Society, in proposing a vote of thanks to Mr. Richardson, said that Mr. Richardson

had given a most interesting and instructive lecture and his explanation of the experiments in the wheat plots showed the excellent results achieved. The college was exercising an invaluable influence over agriculture in the State, and farmers owed a great debt of gratitude to it and its principal, to the Department of Agriculture, and the officers connected with it. Some years ago farmers were somewhat sceptical about the agricultural college, but that view was changed. He had advised about twenty of the Donald farmers to come along with him, and he was sure they had learned something from their visit. The interest that was now taken in the operations of the college was shown by the fact that farmers had come 80 miles that day to swell the large gathering that was present. Mr. J. Gould, president of the Warracknabeal Society, emphasized the unwisdom of the Department in allowing highly trained officers of the Department to be taken away by outside organizations. If any increase of salary was necessary to retain their services the farmers would back up the Government in anything they did to keep those officers in the Department. If these officers were valuable to outside employers they were just as valuable to the Department, and they entered their protest against the Government allowing them to go. The motion was carried by acclamation.

AUSTRALIAN WHEATS.

The Director of the Institute of Science and Industry, Sir George Knibbs, draws attention to the issue of a new bulletin on the classification of wheat varieties, which has just been published by the Institute. This bulletin is a revision and extension of one published by the Institute in 1920, and like it has been prepared by the special committee on seed improvement, under the chairmanship of Mr. A. E. V. Richardson, Director of the School of Agriculture, University of Melbourne. It contains information of a practical and scientific nature on 82 of the most important Australian wheat varieties. The first portion is concerned mainly with the botanical classification of the wheat species, and gives an account of the various characters which may be used for classifying varieties into classes and types, such as colour of chaff, presence or absence of beard, and colour of grain. Special consideration has been given to ascertaining the variability of such agricultural characters, as height of straw, stooling capacity and season of ripening.

The 82 varieties which are minutely described and classified include all varieties which at the present time are of any known value in the Commonwealth. They represent a collection, not only of the varieties known in every State, but also of those which have become popular in certain districts only.

In order to make the bulletin of especial value to the practical man, as well as to the plant breeder, an effort has been made to gather all the reliable information possible on the more practical points in regard to each variety, such as amount of foliage, height and coarseness of straw, disease resistance, districts in which a variety is popular and other points of importance to the farmer.

The bulletin contains photographs illustrating characters of assistance in identifying varieties. On application to the Institute copies will be supplied to inquirers.

ARTIFICIAL FERTILIZERS.

(Registered under the Fertilizers Act for the year 1924.)

P. Rankin Scott, Chemist for Agriculture.

What is a Fertilizer?

A fertilizer is defined under the Act to be any material containing nitrogen, phosphoric acid, or potash, which has been manufactured, produced or prepared in any manner for the purpose of fertilizing the soil or supplying nutriments to the plant.

Registration of Brands.

All manufacturers or importers of fertilizers who intend offering for sale any such material as above described shall, on or before the first day of November in each year, make application to the Director of Agriculture for the registration of a brand in respect to any such fertilizer. Every such application shall set forth:—

(*a*) The full name and place of business of the applicant.

(*b*) The figure, trade mark, or other sign to be attached to or associated with the fertilizer.

(*c*) A statement of the result of a chemical analysis, stating the proportion per centum in which the fertilizer contains the three ingredients, and the respective forms in which they occur.

(*d*) The retail price per ton of the fertilizer.

Unit Values.

Some method of comparing the monetary values of fertilizers is necessary. As a means to this end, unit values, which represent the cost of 1 per cent. by weight of the various fertilizing constituents, are calculated.

From the results of the analyses of fertilizers as set forth in the application for the registration of brands, and taking into account the constituents which have a commercial value and the value thereof in the simple fertilizers, the average unit value is calculated. Simple fertilizers are those having a definite chemical composition and those of animal origin, such as blood and bonedust.

The unit values are useful for comparative purposes and as a guide to the buyer as to whether the price asked for the fertilizer is a reasonable one. Upon the sale of any fertilizer the vendor is required to furnish the purchaser with an invoice certificate stating the analysis

of the fertilizer, which should correspond with the analysis on the label attached to the bag. With the aid of either and the unit value given for the respective form of the ingredient stated, the commercial value can be calculated by multiplying the percentage of the ingredient by the unit value for same and adding together the results. As for example:—

Superphosphate 20%.

Analysis.		Unit Value.		
Phosphoric acid—		s. d.		£ s. d.
Water soluble	21.00%	× 4 10	=	5 1 6
Citrate soluble	0.50%	× 4 10	=	0 2 5
Citrate insoluble... ...	1.00%	× 1 0	=	0 1 0
Total	22.50%			
Value per ton			...	£5 4 11

FERTILIZERS ACT 1915 (No. 2652).—LIST OF UNIT VALUES FOR THE YEAR 1924.

	£	s.	d.
Nitrogen, as Nitrate	1	1	3
,, Ammonia	0	18	0
,, Blood ,, Bone and Blood ,, Bone and Flesh	1	1	0
,, in Fine Bone			
,, Coarse Bone	0	18	0
Phosphoric Acid—			
as *Water Soluble*	0	4	10
as *Citrate Soluble* in—			
Superphosphates Nitro-supers Market Garden Manure Complete Manures	0	4	10
Basic Phosphate Blood and Bone			
Fine Bone Bone Fertilizers	0	6	0
Blood, Bone, and Super	0	5	6
Bone and Super			
Roasted and finely ground, Phosphate	0	5	10
as *Citrate Insoluble* in—			
Blood and Bone Coarse Bone	0	5	0
Basic Phosphate Rock Phosphate	0	2	4
in all others	0	1	0
Super, Nitro-super, Market Garden, and Complete Manure			
Potash, as Muriate	0	5	10
,, Sulphate	0	6	3

LIST OF FERTILIZERS REGISTERED AT THE OFFICE OF THE DIRECTOR OF AGRICULTURE UNDER THE FERTILIZERS ACT 1915 (No. 2652) FOR THE YEAR 1924.

Description of Fertilizer.	Brand,	Nitrogen.						Phosphoric Acid.				Potash.	Price asked per ton.	Where Obtainable.
		As Nitrate.	As Ammonia.	As Blood.	As Bone and Flesh.	As Unspecified.	Total.	As Water Soluble.	As Citrate Soluble.	As Citrate Insoluble.	Total.			
Mainly Nitrogenous—		%	%	%	%	%	%	%	%	%	%	%	£ s. d.	
Nitrate of Soda ..	Federal, S.N. ..	15·50	..	..	..	..	15·50	..	..	..	..	..	16 10 0	The Australian Explosives and Chemical Co. Ltd., 370 Little Collins-street, Melbourne
„ „ ..	"Sickle"	15·50	..	..	..	..	15·50	..	..	..	..	..	16 10 0	Cuming, Smith, and Co. Pty. Ltd., 65 William-street, Melbourne
„ „ ..	Mt. Lyell, M.L., in diamond	15·50	..	..	..	..	15·50	..	..	..	..	..	16 10 0	Mount Lyell Mining and Railway Co. Ltd., 381 Little Collins-street, Melbourne
„ „ ..	Wischer and Co. Pty. Ltd.	15·50	..	..	..	..	15·50	..	..	..	..	..	16 10 0	Wischer and Co. Pty., Ltd., 153 William-street, Melbourne
„ „ ..	"Cresco"	15·00	..	..	..	..	15·00	..	..	..	..	..	20 10 0	The Cresco Fertilizers Ltd., North Geelong
Sulphate of Ammonia ..	Federal, A.S. ..	..	20·00	..	..	..	20·00	..	..	..	..	..	18 0 0	The Australian Explosives and Chemical Co. Ltd., 370 Little Collins-street, Melbourne
„ „ ..	"Sickle"	..	20·00	..	..	..	20·00	..	..	..	..	..	18 0 0	Cuming, Smith, and Co. Pty. Ltd., 65 William-street, Melbourne
„ „ ..	Mt. Lyell, M.L., in diamond	..	20·00	..	..	..	20·00	..	..	..	..	.	18 0 0	Mount Lyell Mining and Railway Co. Ltd., 381 Little Collins-street, Melbourne
„ „ ..	Wischer and Co. Pty. Ltd.	..	20·00	..	..	..	20·00	..	..	..	..	..	18 0 0	Wischer and Co. Pty. Ltd. 153 William-street, Melbourne
„ „ ..	M.G. Co., in diamond	..	20·59	..	..	..	20·59	..	..	..	..	..	17 7 6	The Metropolitan Gas Company, Flinders-street, Melbourne
„ „ ..	"Cresco"	..	20·00	..	..	..	20·00	..	..	..	..	..	19 0 0	The Cresco Fertilizers Co., North Geelong
„ „ ..	B.G.C., in diamond ..	..	20·90	..	..	..	20·90	..	..	..	..	..	18 0 0	The Ballarat Gas Company. Ballarat
Blood Manure	"Cockbill's" ..	..	..	8·50	..	..	8·50	..	..	1·00	1·00	..	8 0 0	J. Cockbill, 407 Post Office-place. Melbourne
„	"Arch"	..	..	10·50	..	..	10·50	..	..	1·50	1·50	..	12 0 0	Ballarat and District Co-op. Freezing Co. Ltd., Learmonth-street, Alfredton, Ballarat

LIST OF FERTILIZERS REGISTERED AT THE OFFICE OF THE DIRECTOR OF AGRICULTURE UNDER THE FERTILIZERS ACT 1915 (No. 2652) FOR THE YEAR 1924—*continued.*

Description of Fertilizer.	Brand.	Nitrogen.						Phosphoric Acid.				Potash.	Price asked per ton.	Where Obtainable.
		As Nitrate.	As Ammonia.	As Blood.	As Bone and Flesh.	As Unspecified.	Total.	As Water Soluble.	As Citrate Soluble.	As Citrate Insoluble.	Total.			
Mainly Nitrogenous—continued.		%	%	%	%	%	%	%	%	%	%	%	£ s. d.	
Blood Manure ..	"Imperial" ..	..	..	10·50	..	..	10·50	..	..	..	..	..	14 0 0	W. Angliss and Co. (Australia) Pty. Ltd., 42 Bourke-st., Melb.
,, ...	"Federal" ..	..	..	7·50	..	..	7·50	..	..	..	..	..	7 15 0	The Australian Explosives and Chemical Co. Ltd., 370 Little Collins-street, Melbourne
,, ...	"Sickle"	..	..	7·50	..	..	7·50	..	..	..	..	..	7 15 0	Cuming, Smith, and Co Pty. Ltd., 65 William-street, Melbourne
,, ...	Mt. Lyell, M.L., in diamond	..	..	7·50	..	..	7·50	..	..	..	..	..	7 15 0	Mount Lyell Mining and Railway Co. Ltd., 381 Little Collins-street, Melbourne
,, ...	Wischer and Co. Pty. Ltd.	..	..	7·50	..	..	7·50	..	..	..	..	..	7 15 0	Wischer and Co. Pty. Ltd., 153 William-street, Melbourne
,, ...	"Champion" ..	..	..	12·00	..	..	12·00	..	..	2·00	2·00	..	Not retailed	John Cooke and Co. Pty. Ltd., 534 Collins-street, Melbourne
,, ...	M.C.C., in diamond ..	..	..	8·86	..	..	8·86	..	..	1·25	1·25	0·59	7 10 0	Melbourne City Council, Town Hall, Melbourne
,, ...	Rohs, in circle ..	..	..	9·50	..	..	9·50	..	..	..	..	..	13 5 0	P. Rohs Pty. Ltd., Bridge-street, Bendigo
Mainly Phosphatic—Readily Soluble.														
Superphosphate ..	"Cockbill's" ..	..	..	..	..	..	..	17·00	0·50	0·50	18·00	..	4 10 0	J. Cockbill, 407 Post Office-place, Melbourne
,, ..	W.M.L., in diamond, Standard	..	..	..	..	..	..	17·00	0·50	0·50	18·00	..	4 5 0	Wallarco-Mount Lyell Fertilizer Ltd., Adelaide, South Australia
,, ..	W.M.L., in diamond, High Grade	..	..	..	..	..	..	20·50	0·50	0·50	21·50	..	Adelaide 4 15 0	,, ,, ,,
,, ..	"Cresco" 18 ..	..	..	..	..	..	..	17·00	0·50	1·00	18·50	..	Adelaide 4 10 0	Cresco Fertilizers Ltd., Geelong
,, ..	"Cresco" 22 ..	..	..	..	..	..	..	21·00	0·50	1·00	22·50	..	5 0 0	,, ,, ,,
,, ..	"Federal," O.S. ..	..	..	..	..	..	..	17·00	0·50	0·50	18·00	..	4 10 0	The Australian Explosives and Chemical Co. Ltd., 370 Little Collins-street, Melbourne
,, ..	"Federal," S.S., Special Superphosphate, 22 per cent.	..	..	..	..	..	..	21·00	0·50	1·00	22·50	..	5 0 0	,, ,, ,,

LIST OF FERTILIZERS REGISTERED AT THE OFFICE OF THE DIRECTOR OF AGRICULTURE UNDER THE FERTILIZERS ACT 1915 (No. 2652) FOR THE YEAR 1924—*continued.*

Description of Fertilizer.	Brand.	Nitrogen.						Phosphoric Acid.				Potash.	Price asked per ton.	Where Obtainable.
		As Nitrate.	As Ammonia.	As Blood.	As Bone and Flesh.	As Unspecified.	Total.	As Water Soluble.	As Citrate Soluble.	As Citrate Insoluble.	Total.			
Mainly Phosphatic—Readily Soluble—continued.		%	%	%	%	%	%	%	%	%	%	%	£ s. d.	
Superphosphate ..	"Sickle," Florida Super, 18 per cent.	..	..	..	..	..	..	17·00	0·50	0·50	18·00	..	4 10 0	Cuming, Smith, and Co. Pty. Ltd., 65 William-street, Melbourne
,, ..	"Sickle," Florida Super, 22 per cent.	..	..	..	..	..	..	21·00	0·50	1·00	22·50	..	5 0 0	,, ,, ,,
,, ..	Mt. Lyell, M.L., in diamond, No. 1	..	..	..	..	..	..	17·00	0·50	0·50	18·00	..	4 10 0	Mount Lyell Mining and Railway Co. Ltd., 381 Little Collins-street, Melbourne
,, ..	Mt. Lyell, M.L., in diamond, High Grade, 22 per cent.	..	..	..	..	..	..	21·00	0·50	1·00	22·50	..	5 0 0	,, ,, ,,
,, ..	Wischer and Co. Pty. Ltd.	..	..	..	..	..	..	17·00	0·50	0·50	18·00	..	4 10 0	Wischer and Co. Pty. Ltd., 153 William-street, Melbourne
,, ..	Wischer and Co. Pty. Ltd., Special, 22 per cent.	..	..	..	..	..	..	21·00	0·50	1·00	22·50	..	5 0 0	,, ,, ,,
Moderately Soluble. Super and Phosphatic Guano	"Cresco"	..	..	..	..	..	..	10·50	3·50	6·50	20·50	..	3 15 0	Cresco Fertilizers Ltd., Geelong
Super and Phosphate ..	"Cresco" 30 Phosphate	..	..	..	..	..	..	10·00	1·50	19·50	31·00	..	5 0 0	,, ,, ,,
Basic Phosphate ..	"Federal," B.P. ..	..	..	..	..	..	..	..	14·00	3·00	17·00	..	4 15 0	The Australian Explosives and Chemical Co. Ltd., 370 Little Collins-street, Melbourne
,, ..	"Sickle"	..	..	..	..	..	..	..	14·00	3·00	17·00	..	4 15 0	Cuming, Smith, and Co. Pty. Ltd., 65 William-street, Melbourne
,, ..	Mt. Lyell, M.L., in diamond	..	..	..	..	..	..	..	14·00	3·00	17·00	..	4 15 0	Mount Lyell Mining and Railway Co. Ltd., 381 Little Collins-street, Melbourne
,, ..	Wischer and Co. Pty. Ltd.	..	..	..	..	..	..	..	14·00	3·00	17·00	..	4 15 0	Wischer and Co. Pty. Ltd., 153 William-street, Melbourne
Slowly Soluble. Ground Rock Phosphate	"Federal," G.P., 80 per cent.	..	..	..	..	..	..	..	..	36·65	36·65	..	4 12 6	The Australian Explosives and Chemical Co. Ltd., 370 Little Collins-street, Melbourne

LIST OF FERTILIZERS REGISTERED AT THE OFFICE OF THE DIRECTOR OF AGRICULTURE UNDER THE FERTILIZERS ACT 1915 (No. 2652) FOR THE YEAR 1924—*continued.*

Description of Fertilizer.	Brand.	Nitrogen.						Phosphoric Acid.				Potash.	Price asked per ton.	Where Obtainable.
		As Ammonia.	As Blood.	As Blood and Bone.	As Bone and Flesh.	As Unspecified.	Total.	As Water Soluble.	As Citrate Soluble.	As Citrate Insoluble.	Total.			
Mainly Phosphatic—Slowly Soluble—continued.		%	%	%	%	%	%	%	%	%	%	%	£ s. d.	
Ground Rock Phosphate	"Sickle," 60 per cent.	..	..	..	..	..	..	..	..	27·50	27·50	..	4 0 0	Cuming, Smith, and Co. Pty. Ltd., 65 William-street, Melbourne
" "	"Sickle," 80 per cent.	..	..	..	..	..	..	..	..	36·65	36·65	..	4 12 6	" " "
" "	Mt. Lyell, M.L., in diamond, 60 per cent	..	..	..	..	..	..	..	..	27·50	27·50	..	4 0 0	Mount Lyell Mining and Railway Co. Ltd., 381 Little Collins-street, Melbourne
" "	Mt. Lyell, M.L., in diamond, 80 per cent.	..	..	..	..	..	..	..	..	36·65	36·65	..	4 12 6	" " "
" "	Wischer and Co. Pty. Ltd., 60 per cent.	..	..	..	..	..	..	..	..	27·50	27·50	..	4 0 0	Wischer and Co. Pty. Ltd., 153 William-street, Melbourne
" "	Wischer and Co. Pty. Ltd., 80 per cent.	..	..	..	..	..	..	..	..	36·65	36·65	..	4 12 6	" " "
Phosphatic Guano ..	"Cresco"	..	..	..	..	..	..	..	6·75	13·50	20·25	..	5 15 0	Cresco Fertilizers Ltd., Geelong
Phosphate	"Victoria," Roasted and Intensely Ground	..	..	..	..	..	..	..	3·00	12·00	15·00	..	4 8 6	The Phosphate Co-operative Co of Australia Ltd., 440 Little Collins-street, Melbourne
"	"Victoria," No. 3, Unroasted and Coarsely Ground	..	..	..	..	..	..	..	..	14·00	14·00	..	2 16 0	" " "
"	"Victoria," No. 4, Unroasted and Coarsely Ground	..	..	..	..	..	..	..	..	11·00	11·00	..	2 5 0	" " "
Ground Rock Phosphate	Hasell's "Marion," 60 per cent.	..	..	..	..	..	..	..	..	27·50	27·50	..	4 7 6	Arthur H. Hasell, 17 Queen-street, Melbourne
Mixed Manures. Containing Nitrogen and Phosphoric Acid and Potash. Moderately Soluble.														
Market Garden ..	"Federal," M.G. ..	..	1·50	..	1·50	..	3·00	9·35	1·71	2·04	13·10	2·50	8 0 0	The Australian Explosives and Chemical Co. Ltd., 370 Little Collins-street, Melbourne
" ..	"Sickle"	..	1·50	..	1·50	..	3·00	9·35	1·71	2·04	13·10	2·50	8 0 0	Cuming, Smith, and Co. Pty. Ltd., 65 William-street, Melbourne
" ..	Mt. Lyell, M.L., in diamond	..	1·50	..	1·50	..	3·00	9·35	1·71	2·04	13·10	2·50	8 0 0	Mount Lyell Mining and Railway Co. Ltd., 381 Little Collins-street, Melbourne

LIST OF FERTILIZERS REGISTERED AT THE OFFICE OF THE DIRECTOR OF AGRICULTURE UNDER THE FERTILIZERS ACT 1915 (No. 2652) FOR THE YEAR 1924—*continued.*

Description of Fertilizer.	Brand.	Nitrogen.						Phosphoric Acid.				Potash.	Price asked per ton.	Where Obtainable.
		As Nitrate.	As Ammonia.	As Blood.	As Bone and Flesh.	As Unspecified.	Total.	As Water Soluble.	As Citrate Soluble.	As Citrate Insoluble.	Total.			
Mixed Manures. Containing Nitrogen and Phosphoric Acid and Potash. Moderately Soluble—continued.		%	%	%	%	%	%	%	%	%	%	%	£ s. d.	
Market Garden ..	Wischer and Co. Pty. Ltd.	..	1·50	..	1·50	..	3·00	9·30	1·76	2·04	13·10	2·50	8 0 0	Wischer and Co. Pty. Ltd., 153 William-street, Melbourne
Mixed Manure	Anglo - Continental Guano	..	4·87	..	..	..	4·87	8·85	2·39	1·37	12·61	1·89	20 0 0	Gibbs, Bright, and Co., 34 Queen-street, Melbourne
,, ...	Co-operative Fertilizer	..	1·82	..	..	..	1·82	..	2·77	7·90	10·67	5·86	8 12 6	Mildura Co-operative Fruit Co. Ltd., Mildura
,, ...	"Cresco"	..	1·50	..	..	..	1·50	9·20	1·40	10·60	21·20	5·00	7 5 0	Cresco Fertilizers Ltd., Geelong
,, ...	"Federal," No. 1, Complete Manure	..	2·50	..	..	..	2·50	10·78	0·31	0·31	11·40	7·05	8 15 0	The Australian Explosives and Chemical Co. Ltd., 370 Little Collins-street, Melbourne
,, ...	"Federal," No. 2, Complete Manure	..	1·00	1·00	..	..	2·00	10·04	0·29	0·29	10·62	5·00	7 10 0	,, ,, ,,
,, ...	"Federal," No. 3, Complete Manure	..	..	..	2·00	..	2·00	8·07	3·04	3·83	14·94	6·25	8 15 0	,, ,, ,,
,, ...	"Sickle," No. 1, Complete Manure	..	2·50	..	..	..	2·50	10·78	0·31	0·31	11·40	7·05	8 15 0	Cuming, Smith, and Co. Pty. Ltd., 65 William-street, Melbourne
,, ...	"Sickle," No. 2, Complete Manure	..	1·00	1·00	..	..	2·00	10·04	0·29	0·29	10·62	5·00	7 10 0	,, ,, ,,
,, ...	"Sickle," No. 3, Complete Manure	..	..	..	2·00	..	2·00	8·07	3·04	3·83	14·94	6·25	8 15 0	,, ,, ,,
,, ...	Mt. Lyell, No. 1, Complete Manure	..	2·50	..	..	..	2·50	10·78	0·31	0·31	11·40	7·05	8 15 0	Mount Lyell Mining and Railway Co. Ltd., 381 Little Collins-street, Melbourne
,, ...	Mt. Lyell, No. 2, Complete Manure	..	1·00	1·00	..	..	2·00	10·04	0·29	0·29	10·62	5·00	7 10 0	,, ,, ,,
,, ...	Mt. Lyell, No. 3, Complete Manure	..	..	..	2·00	..	2·00	8·07	3·04	3·83	14·94	6·25	8 15 0	,, ,, ,,
,, ...	Wischer and Co. Pty. Ltd., No. 1, Complete Manure	..	2·50	..	..	..	2·50	10·78	0·31	0·31	11·40	7·05	8 15 0	Wischer and Co. Pty. Ltd., 153 William-street, Melbourne
,, ...	Wischer and Co. Pty. Ltd., No. 2, Complete Manure	..	1·00	1·00	..	..	2·00	10·04	0·29	0·29	10·62	5·00	7 10 0	,, ,, ,,
,, ...	Wischer and Co. Pty. Ltd., No. 3, Complete Manure	..	..	..	2·00	..	2·00	8·07	3·04	3·83	14·94	6·25	8 15 0	,, ,, ,,

LIST OF FERTILIZERS REGISTERED AT THE OFFICE OF THE DIRECTOR OF AGRICULTURE UNDER THE FERTILIZERS ACT 1915 (No. 2652) FOR THE YEAR 1924—*continued.*

Description of Fertilizer.	Brand.	Nitrogen.						Phosphoric Acid.				Potash.	Price asked per ton.	Where Obtainable.
		As Nitrate.	As Ammonia.	As Blood.	As Bone and Flesh.	As Unspecified.	Total.	As Water Soluble.	As Citrate Soluble.	As Citrate Insoluble.	Total.			
		%	%	%	%	%	%	%	%	%	%	%	£ s. d.	
Containing Phosphoric Acid and Potash. Slowly Soluble.														
Mixed Manure	Victoria Phosphate and Potash Sulphate	..	..	..	..	..	..	..	4·00	9·50	13·50	5·00	8 6 0	The Phosphate Co-operative Co. of Australia Ltd., 440 Little Collins-street, Melbourne
Containing Nitrogen and Phosphoric Acid. Readily Soluble.														
Nitro-Superphosphate ..	"Federal," N.S. ..	..	1·50	..	0·50	..	2·00	13·00	1·01	1·15	15·16	..	6 10 0	The Australian Explosives and Chemical Co. Ltd., 370 Little Collins-street, Melbourne
,, ..	"Sickle"	..	1·50	..	0·50	..	2·00	13·00	1·01	1·15	15·16	..	6 10 0	Cuming, Smith, and Co. Pty. Ltd., 65 William-street, Melbourne
,, ..	Mt. Lyell, M.L., in diamond	..	1·50	..	0·50	..	2·00	13·00	1·01	1·15	15·16	..	6 10 0	Mount Lyell Mining and Railway Co. Ltd., 381 Little Collins-street, Melbourne
,, ..	Wischer and Co. Pty. Ltd.	..	1·50	..	0·50	..	2·00	13·00	1·08	1·28	15·36	..	6 10 0	Wischer and Co. Pty. Ltd., 153 William-street, Melbourne
Moderately Soluble														
Ammonia and Phosphate	"Cresco"	..	2·00	..	..	..	2·00	10·00	2·00	18·00	30·00	..	6 10 0	Cresco Fertilizers Ltd., Geelong
Super and Bone ..	"Federal," S.B. ..	..	..	..	1·00	..	1·00	13·17	1·83	2·15	17·15	..	6 0 0	The Australian Explosives and Chemical Co. Ltd., 370 Little Collins-street, Melbourne
,, ,, ..	"Sickle," Mixed, "C"	..	..	..	1·00	..	1·00	13·17	1·83	2·15	17·15	..	6 0 0	Cuming, Smith, and Co. Pty. Ltd. 65 William-street, Melbourne
,, ,, ..	Mt. Lyell, No. 2 ..	..	..	..	1·00	..	1·00	13·17	1·83	2·15	17·15	..	6 0 0	Mount Lyell Mining and Railway Co. Ltd., 381 Little Collins-street, Melbourne
,, ,, ..	Wischer and Co. Pty. Ltd., No. 2	..	..	..	1·00	..	1·00	13·12	1·88	2·15	17·15	..	6 0 0	Wischer and Co. Pty. Ltd., 153 William-street, Melbourne
Blood, Bone, and Super..	"Cockbill's" ..	..	..	..	2·50	..	2·50	8·50	2·25	6·25	17·00	..	7 0 0	J. Cockbill, 407 Post Office-place, Melbourne
,, ,, ..	"Cresco"	..	..	..	3·50	..	3·50	10·50	5·00	2·75	18·25	..	8 15 0	Cresco Fertilizers Ltd., Geelong
,, ,, ..	"Federal," B.B.S. ..	..	..	..	2·40	..	2·40	10·20	1·56	1·84	13·60	..	6 15 0	The Australian Explosives and Chemical Co. Ltd., 370 Little Collins-street, Melbourne

LIST OF FERTILIZERS REGISTERED AT THE OFFICE OF THE DIRECTOR OF AGRICULTURE UNDER THE FERTILIZERS ACT 1915 (No. 2652) FOR THE YEAR 1924—*continued*.

Description of Fertilizer.	Brand.	Nitrogen.						Phosphoric Acid.				Potash.	Price asked per ton.	Where Obtainable.
		As Nitrate.	As Ammonia.	As Blood.	As Bone and Flesh.	As Unspecified.	Total.	As Water Soluble.	As Citrate Soluble.	As Citrate Insoluble.	Total.			
Containing Nitrogen and Phosphoric Acid—Moderately Soluble—continued.		%	%	%	%	%	%	%	%	%	%	%	£ s. d.	
Blood, Bone, and Super..	Rohs, in circle ..	..	..	4·00	..	..	4·00	5·50	6·25	6·25	14·00	..	9 17 6	P. Rohs Pty. Ltd., Bridge-street, Bendigo
,, ...	"Sickle"	..	..	..	2·40	..	2·40	10·20	1·56	1·84	13·60	..	6 15 0	Cuming, Smith, and Co. Pty. Ltd. 65 William-street, Melbourne
,, ,, ..	Mt. Lyell, M.L., in diamond	..	..	..	2·40	..	2·40	10·20	1·56	1·84	13·60	..	6 15 0	Mount Lyell Mining and Railway Co. Ltd., 381 Little Collins-street, Melbourne
,, ...	Wischer and Co. Pty. Ltd.	..	..	..	2·40	..	2·40	10·20	1·70	2·10	14·00	..	6 15 0	Wischer and Co. Pty. Ltd., 153 William-street Melbourne
Bone and Super ..	"Gardiner's" ..	...	..	..	..	1·39	1·39	3·20	5·80	8·00	17·00	..	7 15 0	Geo. Gardiner and Co. Pty. Ltd., Marshall, Geelong
,, ,, ..	"Federal," B.S., No. 1	..	..	..	..	2·00	2·00	9·35	3·15	3·80	16·30	..	6 15 0	The Australian Explosives and Chemical Co. Ltd., 370 Little Collins-street, Melbourne
,, ..	"Sickle," Mixed, "A"	..	..	..	..	2·00	2·00	9·35	3·15	3·80	16·30	..	6 15 0	Cuming, Smith, and Co. Pty. Ltd. 65 William-street, Melbourne
,, ...	Wischer and Co. Pty. Ltd.	..	..	..	..	2·00	2·00	9·25	3·25	3·80	16·30	..	6 15 0	Wischer and Co. Pty. Ltd., 153 William-street, Melbourne
,, ,, ..	Mt. Lyell, M.L., in diamond, No. 1	..	..	..	..	2·00	2·00	9·35	3·15	3·80	16·30	..	6 15 0	Mount Lyell Mining and Railway Co. Ltd., 381 Little Collins-street, Melbourne
Bonedust and Super ..	Bendigo, Rohs, in circle	..	..	..	..	1·50	1·50	8·50	5·25	4·25	18·00	..	9 0 0	P. Rohs Pty. Ltd., Bridge-street, Bendigo
Blood and Bonedust ..	Rohs, in circle ..	..	..	..	6·00	..	6·00	..	3·00	6·00	9·00	..	11 15 0	,, ,, ,,
Blood and Bone ..	"Cockbill's" Fertilizer	..	..	..	5·00	..	5·00	..	4·00	12·00	16·00	..	9 0 0	J. Cockbill, 407 Post Office-place, Melbourne
,, ,, ..	"Cockbill's" Manure	..	..	..	5·50	..	5·50	..	4·00	10·00	14·00	..	1 0 0	,, ,, ,,
,, ,, ..	"Arch" Fertilizer ..	..	..	..	5·00	..	5·00	..	3·50	9·00	12·50	..	9 0 0	Ballarat and District Co-op. Freezing Co. Ltd., Learmonth-street, Alfredton, Ballarat
,, ,, ..	D.B.C., in triangle, Fertilizer	..	..	..	5·30	..	5·30	..	3·96	7·52	11·48	..	10 0 0	Gippsland Co-op. Bacon Curing Co. Ltd., Dandenong
,, ,, ..	Imperial, in diamond	..	..	..	4·75	..	4·75	..	5·00	10·00	15·00	..	9 0 0	W. Angliss and Co. (Australia) Pty. Ltd., 42 Bourke-street Melbourne

LIST OF FERTILIZERS REGISTERED AT THE OFFICE OF THE DIRECTOR OF AGRICULTURE UNDER THE FERTILIZERS ACT 1915 (No. 2652) FOR THE YEAR 1924—*continued*.

Description of Fertilizer.	Brand.	Nitrogen.						Phosphoric Acid.				Potash.	Price asked per ton.	Where Obtainable.
		As Nitrate.	As Ammonia.	As Blood.	As Bone and Flesh.	As Unspecified.	Total.	As Water Soluble.	As Citrate Soluble.	As Citrate Insoluble.	Total.			
***Containing Nitrogen and Phosphoric Acid—Moderately Soluble*—continued.**		%	%	%	%	%	%	%	%	%	%	%	£ s. d.	
Blood and Bone ..	"Federal," B.B. ..	..	..	..	5·00	..	5·00	..	7·00	9·00	16·00	..	9 5 0*	The Australian Explosives and Chemical Co. Ltd., 370 Little Collins-street, Melbourne
" " ..	"Sickle"	..	..	..	5·00	..	5·00	..	7·00	9·00	16·00	..	9 5 0*	Cuming, Smith, and Co. Pty. Ltd., 65 William-street, Melbourne
" " ..	Mt. Lyell, M.L., in diamond	..	..	..	5·00	..	5·00	..	7·00	9·00	16·00	..	9 5 0*	Mount Lyell Mining and Railway Co. Ltd., 381 Little Collins-street, Melbourne
" " ..	Wischer and Co. Pty. Ltd.	..	..	..	5·00	..	5·00	..	7·00	9·00	16·00	..	9 5 0*	Wischer and Co. Pty. Ltd., 153 William-street, Melbourne
Animal Fertilizer ..	"Champion" ..	..	..	..	6·00	..	6·00	..	7·50	5·50	13·00	..	Not retailed	John Cooke and Co. Pty. Ltd., 534 Collins-street, Melbourne
Slowly Soluble.														
Animal Fertilizer ..	A.N.A., "Surprise"	..	..	..	3·00	..	3·00	..	4·00	12·00	16·00	..	9 0 0	G. W. Pennell, Braybrook
Fertilizer	Gardiner's "Special Magic"	..	..	..	5·00	..	5·00	..	3·00	10·00	13·00	..	8 5 0	Geo. Gardiner and Co. Pty. Ltd., Geelong
Bone Fertilizer ..	"Samson" ..	..	..	..	..	12·00	2·00	..	2·00	15·00	17·00	..	7 12 6	" " "
" ..	"No. 1 Magic" ..	..	..	..	..	12·00	2·00	..	2·00	15·00	17·00	..	7 12 6	" " "
" ..	"Ark"	..	..	..	..	3·16	3·16	..	3·66	15·60	19·26	..	8 10 0	Arthur Murphy, Barkly-street, Ararat
" ..	"Bailey Bros." ..	..	..	..	..	2·50	2·50	..	6·50	9·50	16·00	..	8 0 0	Bailey Bros., 155 Main-street, Ballarat
" ..	"Federal," B.F. ..	..	..	..	4·00	..	4·00	1·50	6·01	7·09	14·60	..	8 0 0†	The Australian Explosives and Chemical Co. Ltd., 370 Little Collins-street, Melbourne
..	"Sickle"	..	..	..	4·00	..	4·00	1·50	6·01	7·09	14·60	..	8 0 0†	Cuming, Smith, and Co. Pty. Ltd., 65 William-street, Melbourne
" ..	Mt. Lyell, M.L., in diamond	..	..	..	4·00	..	4·00	1·50	6·01	7·09	14·60	..	8 0 0†	Mount Lyell Mining and Railway Co. Ltd., 381 Little Collins-street, Melbourne
" ..	Wischer and Co. Pty. Ltd.	..	..	..	4·00	..	4·00	1·50	6·01	7·09	14·60	..	8 0 0†	Wischer and Co. Pty. Ltd., 153 William-street, Melbourne
Phosphatic Guano and Bone and Blood	"Cresco," B.B. ..	..	..	..	3·00	..	3·00	..	4·00	12·00	16·00	..	8 5 0	Cresco Fertilizers Ltd., Geelong

* Since reduced to £8 per ton. † Since reduced to £6 15s. per ton.

LIST OF FERTILIZERS REGISTERED AT THE OFFICE OF THE DIRECTOR OF AGRICULTURE UNDER THE FERTILIZERS ACT 1915 (No. 2652) FOR THE YEAR 1924—*continued.*

Description of Fertilizer.	Brand.	Nitrogen.						Phosphoric Acid.				Potash.	Price asked per ton.	Where Obtainable.
		As Nitrate.	As Ammonia.	As Blood.	As Bone and Flesh.	As Unspecified.	Total.	As Water Soluble.	As Citrate Soluble.	As Citrate Insoluble.	Total.			
Mainly Potassic. Readily Soluble.		%	%	%	%	%	%	%	%	%	%	%	£ s. d.	
Muriate of Potash ..	"Cresco"	..	..	..	..	..	..	..	..	..	..	50·00	14 10 0	Cresco Fertilizers Ltd., Geelong
Sulphate of Potash ..	"Cresco"	..	..	..	..	..	..	..	..	..	..	50·00	20 0 0	
,, ,, ..	"Hasell's" ..	..	..	..	..	..	..	..	..	..	..	48·65	16 10 0	A. H. "Hasell," 17 Queen-street, Melbourne
,, ,, ..	"Federal" ..	..	..	..	..	..	..	..	..	..	..	50·00	15 0 0	The Australian Explosives and Chemical Co. Ltd., 370 Little Collins-street, Melbourne
,, ,, ..	"Sickle"	..	..	..	..	..	..	..	..	..	..	50·00	15 0 0	Cuming, Smith, and Co. Pty. Ltd., 65 William-street, Melbourne
,, ,, ..	Mt. Lyell, M.L., in diamond	..	..	..	..	..	..	..	..	..	..	50·00	15 0 0	Mount Lyell Mining and Railway Co. Ltd., 381 Little Collins-street, Melbourne
,, ,, ..	Wischer and Co. Pty. Ltd.	..	..	..	..	..	..	..	..	..	..	50·00	15 0 0	Wischer and Co. Pty. Ltd., 153 William-street, Melbourne

Description of Fertilizer.	Brand.	Nitrogen.	Phosphoric Acid.	Mechanical Condition.		Price asked per ton.	Where Obtainable.
				Fine Bone.	Coarse Bone.		
		%	%	%	%	£ s. d.	
Bonedust	White Horse ..	2·50	17·00	60·00	40·00	7 15 0	F. W. Richards c/o M. A. Cochrane, 244 Eureka-street, Ballarat East
,, ...	Bailey Bros. ..	3·00	18·00	30·00	70·00	8 10 0	Bailey Bros., 155 Main-street, Ballarat
,, ...	"Horseshoe" ..	4·00	18·00	27·00	73·00	9 0 0	P. Fitzgerald and Sons, Warragul-road, Bentleigh
,, ...	Rohs, in circle, "Bendigo"	4·00	18·00	55·00	45·00	9 17 6	P. Rohs Pty. Ltd., Bridge-street, Bendigo

P. RANKIN SCOTT,
Chemist for Agriculture.

SELECTION AND CARE OF THE BULL.

By A. J. Gill, Dairy Supervisor.

Necessity for Care in Selection.

The Government Herd Test has furnished indisputable proof of the value of pure-bred sires. Farmers are now commencing to realize this, and one frequently hears questions asked as to what qualities should be looked for in a bull and how he should be fed and cared for, in order to obtain the best results. To the first question the breeder who is not testing his cows will invariably answer, "Select on type—pick your animals by appearance"; but the inference from the fact that he is not testing his herd is that he is not anxious to let the public know what are the actual results attainable by his cows. Unfortunately the giver of such advice is very often not quite clear as to what he means by "correct type," and has in mind the image of two distinct animals—one for show purposes and one for dairying. As an illustration of this a noted breeder at a recent Royal Show asked an officiating judge why his bull had not been awarded a prize, and was informed that the animal had too much dairy type. Yet the animal was of a breed kept solely for dairying.

Dairy farmers would certainly be well advised to confine themselves to tested stock. The only infallible guides as to the butter-fat producing qualities of a cow are the scales and the testing machine, and it is butter-fat that pays the mortgage off.

The herd testing carried out by the Department of Agriculture enables the farmer to know the best producing herd from which to choose a bull for his herd. The members of the staff carrying out the test are always eager to assist any one in tracing pedigrees, so that the best animal may be found.

A point to be remembered is that animals showing pureness of blood, combined with heavy producing ability for several generations back, will usually pass these good qualities on to their progeny. A bull whose pedigree is unknown should be avoided if possible. A mongrel sire or dam a few generations back in the pedigree may be the cause of disappointing results.

A farmer having selected the particular family of animals from which he intends to obtain a bull should, if possible, choose one from a dam which, while a heavy producer, is also of good temper and docile disposition. It is difficult to get the best out of cows that will refuse to go quietly into the bail if a stranger happens to be present, or that will hold up their milk on the slightest provocation; and it will take years to breed the highly nervous and wild disposition out of a herd.

Sometimes a farmer may obtain the offer of what is known as a tested bull—that is, a bull whose progeny has been tested; but no such offer should be accepted without investigation unless the buyer knows exactly what the bull's value as a dairy sire is, for an owner will be rarely anxious to part with an animal that has proved himself a begetter of superior stock. Having obtained a bull, no farmer should part with him until his heifers have been tested.

Care of the Bull.

A bull should always be carefully handled. He should be taught to lead well and to stand tethering when a few weeks old. If well trained when young he will be tractable and easy to manage when grown. It is a bad practice to neglect teaching him to lead till he is strong enough to give trouble. He must be treated firmly, and certainly should not be teased in any way. Bulls have more intelligence than many people suppose. They form strong likes and dislikes, and never forget any one who has ill-treated them. A bull may be docile at one man's hands and quite dangerous when handled by another who at some time has beaten him. It may be well to say, however, that no matter how quiet a bull may be, he must always be watched—he can never really be trusted. The keeping of a bull alone in a small yard tends to make him morose and sullen.

If possible he should have a small paddock to exercise in where he can pick up most of his food. An aged cow can usually he run with him—her company will keep him in much better humour. It is essential that a bull should have plenty of exercise if he is to be a sure calf-getter. The writer has known of a bull kept in a small yard becoming too lazy to serve the cows. The necessity of exercise was mentioned to the owner, who turned the animal into a large paddock during the day. After a fortnight in the open the bull served three cows on one day, and failure to serve cows since has not recurred.

The age at which a bull may be given regular work is eighteen months. If taken care of there is no reason why he should not be kept till he about thirteen years or even older. I know of a case where two bulls were used—one a pure-bred Jersey: the other a mongrel —in a herd of from sixty to sixty-five cows for over thirteen years. They ran with the cows day and night, and received no attention whatever. The majority of the calves each year were apparently by the pure-bred sire, which would indicate that the idea held by some farmers that a mongrel bull is the surer calf-getter has not a sound basis.

The first ring should be placed in a bull's nose when the animal is about eight months old. The ring should be an inch and a half in diameter. In a few months it should be replaced by one two inches in diameter, and when the bull is two years old a three-inch ring should be used. The ring must be examined frequently and renewed as soon as it shows signs of wear. A ring breaking at a critical time may cause serious trouble.

A bull calf intended for stud purposes should be fed on skim milk for the first seven months, and he should have access to clear pasture. Sex maturity is attained at six months. It is therefore advisable to remove the heifer calves when they are about five months old. The young bull should be kept in a thrifty condition. Starvation will not only retard development, but will render the animal more liable to attacks of disease. On the other hand he must not be over-fed. It is a mistake to permit a bull to fatten.

The following is a good mixture for a growing bull:—6 parts bran, 4 parts crushed oats, 1 part linseed meal. From three to seven pounds will be a sufficient ration. If the pasture is not good he should also be given some meadow or leguminous (lucerne, clover, &c.) hay as well. For a full-grown bull the mixture should be varied to— 5 parts bran, 5 parts crushed oats, 1 part linseed meal. In addition

he should be given a liberal allowance of good hay, so as to keep him in what is known as a good forward store condition.

In-breeding and Line-breeding.

The questions—"What is in-breeding?" and "What is line-breeding?" are often asked. In-breeding is mating such close relations as father with daughter, son with mother, or brother with sister. Line-breeding is crossing animals not so closely related, but belonging to the same family. In-breeding intensifies in the off-spring any characteristic good or bad qualities possessed by the parents in common. Use can thus be made of in-breeding to fix quickly a certain desired characteristic. As any particular physical unsoundness, however, is most likely to be similarly possessed by members of one family, great care is necessary that the peculiarities intensified do not include bad health or poor constitution.

Only undoubtedly robust animals of close blood-relationship should be mated. Their robustness will be likely to be a characteristic transmitted to the progeny. Animals used even by in-breeders to continue the intensifying process are often found to be by no means closely related, but the nearest admissible considering the constitution factor.

When the relationship becomes very distant the term "line-breeding" comes into use. Both in-breeding and line-breeding make for improvement, provided undesirable characteristics are absent from both animals. The onus is on the breeder. Farmers who have secured a pure-bred bull from high-producing blood have made a good beginning, and may confidently go a step further by getting one or two pure-bred females to become the foundation members of an all-pure herd. The demand for pure-bred animals is growing, and once dairymen are seized with the advantages of such a herd they are not likely to revert to the mongrel herd.

SOME HINTS ON MILKING.

R. T. McKenzie, Senior Dairy Supervisor.

In the operation of milking, relations between the cow and the milker must be harmonious if the best results are to be obtained.

The nervous system of the dairy cow is very closely related to her mammary system, and just as the secretion and extraction of milk are closely allied, the nervous and mammary systems are inseparable. It is generally conceded that a considerable amount of milk that a cow gives is actually secreted during the process of milking, and that being so, the greatest quantity of milk the cow is capable of giving cannot be obtained if she is annoyed or irritated; or if the udder is hurt by faulty manipulation on the part of the milker. By careless and improper methods of milking the lactation period may be seriously shortened, the animal drying off long before her normal period. The aim of the milker, therefore, should be to extract the greatest volume of milk without irritating the cow or doing injury to the udder. The rough treatment often meted out to the cow, such as scolding, kicking, or striking her if she is a little obstreperous when being put into the bail, generally affects the flow of milk and the amount of butter-fat it contains. Pure-bred

animals are more susceptible in this respect than grade cows, as their nervous system is more highly developed. It must also be borne in mind that temper, like the milking faculty, is hereditary, and the aim should be, by considerate treatment, to have contentment and a gentle disposition developed in the herd.

The operation of milking should be performed quietly, quickly and deftly, with the full hand, not merely the finger and thumb. Any rough manipulation of the udder will interfere with the work of the lacteal glands. Clean stripping is very necessary, for it is generally known that the last milk drawn from the udder is much richer in fat than the first, and apart from this there is the danger of curtailing the lactation period, for the cow soon becomes accustomed to such treatment, decreasing the flow until it ultimately ceases. At the same time the process of stripping should not be too prolonged in case the animal should develop a tendency to " strippiness," a thing all milkers detest.

As the cow is a creature of habit and routine, it is advisable for the same milker to milk the same lot of cows on each occasion. It has been proved by experience that the usual milker will get the milk more readily than a strange one, no matter how skilful the stranger may be. In the case of machine-milked cows, they are not milked right out, and it is necessary for a " stripper " to follow the machines. It is largely through this break in the continuity of milking, that machine-milked cows dry off a little earlier than hand-milked ones. The interval between morning and evening milking should be as even as possible. The evening's milk is usually richer in fat than the morning's. The greater the interval, the greater the variation in the test. The importance of well-regulated milking hours is therefore obvious. At the same time it should be stated that many experiments have demonstrated that there is a natural variation between the night and morning milk. Even when the interval between milkings are even, the evening milk is generally richer in fat. The reason for this difference is somewhat obscure. It is thought by some that the more active metabolism in the animal body during the day may cause this variation, or that the increase of fat in the evening's milk is a provision of nature to supply the calf with more energy during the night, when it is required more than during the day.

Many discussions have taken place over the question of wet *versus* dry milking. Wet milking has been condemned because of the neglect of some milkers to take ordinary precautions against contamination. As under this method the teat is usually moistened by dipping the fingers into the pail of milk, it is easy to understand the contamination that follows. This dirty practice cannot be too vigorously condemned. With dry milking, unless the udder is previously washed, dust and scales are liable to fall into the milk and cause as much damage as would take place with wet milking. If the udder is washed prior to milking and the hands of the milker also, the teats will be sufficiently moistened without the need of resorting to the dirty practices before mentioned. To summarize:—

1. Don't frighten or ill-treat the cow about to be milked, or her nervous system will be upset. This will mean less and inferior quality milk.

2. The milking should be done quietly, quickly and deftly with as much full hand milking as possible.

3. Strip thoroughly or else the lactation period will be shortened. The strippings are the richest part of the milk.

4. As far as possible, the same milker ought to milk the same cows at each milking.

5. Arrange that the interval between milking be as even as possible to avoid any great variation in fat content (this is more important in the case of milk vendors).

6. Avoid wet milking; it is a dirty method, and will adversely affect the grade of cream.

ORCHARD AND GARDEN NOTES.

E. E. Pescott, F.L.S., Pomologist.

The Orchard.

If the work has not already been done, the orchard should be kept in constant cultivation so as to conserve the abundant spring rains. Should the summer become hot and dry, this will be a very necessary precaution. Even where the soil had been previously well cultivated, the cultivators should again be run over the surface, as any hot weather will cause the soil to crust, which would be the means of dissipating a very considerable amount of soil water. Every effort should be taken to retain this moisture so that the fruit crops shall have all they require for their perfection. To further attain this end no weeds should be allowed to grow in orchard soils

BUDDING.

Young trees, or old trees that have been previously cut down in preparation for budding, may be worked towards the end of the month. It is advisable to select dull, cool weather for this operation, so that the sap may run more freely, and that atmospheric conditions may not have too drying an effect on the bud. The operation of budding is a very simple one, and is easily performed. To gain a successful end, the sap should be flowing freely, so that when the cuts are made the bark should "lift" or "run" easily, and without any clinging or tearing of the fibres, and it should separate freely from the wood. The bud selected should be firm and well matured, and should show no signs of premature growth whatever. It should be cut from the scion with a shallow cut, and if any wood be left in the cutting it should be taken out of the bud. A smooth, clean spot should be selected on the bark of the stock, and a T-shaped cut made, the vertical cut being longer than the horizontal one. The bark at the point where the cuts meet should be raised, and the bud inserted between the bark and the wood of the stock. The bud should be gently pressed down into position, and then bound with soft twine, string, or raffia. If the bud be too long for the cut, the top may be cut off level by means of a horizontal cut. With practice it will soon become possible to take the buds so that they will need neither cutting nor trimming.

After two or three weeks the buds should be examined to see if they have "taken"—that is, if the bud has united thoroughly to the stock.

When this occurs, the tie may be cut. If a growth be desired at once all wood above the bud may be cut off some short distance above the bud, so as to prevent any bark splitting, and consequent loss of the bud, and so as to throw the bud out at a fair angle. Ultimately this should be properly trimmed.

If desired, the bud may be left dormant throughout the autumn and winter till spring. In this case the branch should not be cut off, but left on till the usual winter pruning.

SUMMER PRUNING.

The profuse spring rains have caused a vigorous growth in the fruit trees. In order to more economically utilize this abundant growth, it should be now summer pruned, particularly on the apple and pear trees. Care should be observed that as much of the leafage as possible is retained on the tree. Unduly long laterals of fruiting trees may be shortened back, always cutting to a leaf. Unnecessary terminal leader growths, of which there are sometimes three or four, all strong growing, may be reduced to one, retaining this one as a leader. In no case should this growth be cut or interfered with in any way.

The results of these cuts will be to divert the sap which was flowing into growths that would subsequently be pruned, into more profitable channels, so that weak buds and growths may be strengthened, and induced into fruit bearing.

The Vegetable Garden.

The work in this section is much the same as in the flower garden. Good mulching and regular soil stirring will be the work for the month. As soon as any bed is cleared of vegetables it should be manured and well dug over in preparation for the next crop. Deep digging is always desirable in vegetable growing. If any pest, such as aphis, or caterpillars, or tomato weevil, have been present, it would be advisable to burn all the crop refuse, or to destroy any insects that remain, and to give the plot a dressing of gypsum, or of Clift's manurial insecticide.

Keep the tomatoes well watered and manured, pinching out surplus and strong grown laterals. In early districts the onion crop will be ripening. In late districts, or with late crops, the ripening may be hastened by breaking down the top. An autumn crop of potatoes may be planted. Cabbage, cauliflower, lettuce, and celery plants may be planted out. Keep asparagus beds well watered.

The Flower Garden.

January should be a busy month in the garden. It may be necessary to water frequently, and after every watering the surface should be well loosened, and stirred with the hoe to keep it moist and cool. More cultivation and less water is a good rule to be observed. The hoe should be used more, and the hose less, in summer; greater benefits will accrue, and the water bill will be considerably reduced. Mulchings with straw, grass, &c., are very useful just now. The mowings from lawns form valuable mulching. Waste tobacco stems are also valuable as a mulch.

Dahlias, chrysanthemums, gladioli and other tall-growing, slender herbaceous plants will require support in the way of stakes. They will also need mulching considerably. These plants should receive no check whatever, and should be continued with a regular even growth right through the season. Another desideratum is that soils should be well drained, as plants of all descriptions thrive better in well-drained soils.

A sharp look-out should be kept on these plants for attacks of red spider. If this insect appears, a good spraying of tobacco solution or benzole emulsion should be given.

Constant watch will need to be kept for the various small caterpillars that attack the buds of these plants. Spraying with a weak solution of paris green and lime, or similar insecticide, will be useful. Hand-picking should also be resorted to.

REMINDERS FOR FEBRUARY.

CATTLE.—Provide succulent feed and plenty of clean water easy of access; also shade and salt lick in trough. Have each cow's milk weighed and tested for butter fat regularly. Rear heifer calves from those that show profitable results. Give milk at blood heat to calves. Keep utensils clean or diarrhœa will result. Do not give too much at a meal for the same reason. Give half-a-cup of limewater per calf per day in the milk. Let them have a good grass run or lucerne, or half-a-pound of crushed oats in a trough. Dehorn all dairy calves except those required for stud or show purposes. Keep bulls away from cows.

PIGS.—Sows about to farrow should be supplied with short bedding in well-ventilated styes. All pigs should be provided with shade and water to wallow in. There will be plenty of cheap feed available now, and there is a good margin between cost of feed and price for fat pigs. Read *Bulletin* No. 16.

SHEEP.—In the case of very strong cross ewes, rams should not be removed until well on in this month, for this class, together with most pure ewes of British blood, are only now coming in season. In fact, the season being a late and cold one, all breeds of ewes are proving later than usual. To breed out this late lambing tendency, and to procure quality and quantity of wool as well as a good carcass, use carefully-bred, level-made merino rams. If the right type be not procurable at reasonable rates, use good Corriedales or Comebacks. Should there be among the rams any inferior to the others, keep them back for three weeks. Remember, narrow inferior rams are invariably the most active workers compared with sheep of more substance.

VINEYARD.—February is the best month for the "yema," or summer bud graft (see *Bulletin* No. 35, available on application). Select and mark the best-bearing vines of varieties from which scions will be required for next spring's grafting.

Given suitable climatic conditions, downy mildew will make its appearance. If vines were not sprayed in January they should be sprayed this month. The final spray (January or February) is most important for the protection of the foliage, thus insuring the ripening of the fruit and well-nourished wood, without which a good crop cannot be expected next year. Sulphur again, if oidium is prevalent, but avoid sulphuring wine grapes too short a time before gathering. The sulphur may be mixed with Bordeaux mixture, thus enabling the two diseases, oidium and downy mildew, to be combated simultaneously.

Cellars.—Prepare all plant and casks for the coming vintage. An ounce of bisulphite of potash, or a couple of fluid ounces of bisulphite of soda solution, to each bucket of water used to swell press platforms, tubs, &c., will help to keep it sweet. Keep cellars as cool as possible. Complete all manipulations so as to avoid handling older wines during vintage.

In the case of very hot weather occurring during vintage, attention is directed to the new wine-making method by "Preliminary Maceration," described in a pamphlet obtainable on application.

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The first cut is available from 45 to 60 days after sowing, followed by a second and third cut, and sometimes a fourth, although the latter is never heavy, and is usually reserved for seed. All kinds of stock eat it readily, and it may be given to them at any stage of growth; it does not taint milk in the slightest degree. This Clover will re-seed itself in a pasture on good land, and thus becomes practically permanent.

Fallow must be thoroughly clean prior to seeding. Sow through the drill, but care should be taken to see that the points of the drill are kept just on the surface of the ground.

Graze lightly, or cut when plants are a few inches high. They will then stool out well. **Sow 8 to 12 lbs. per acre in drills, or 20 to 30 lbs. broadcast.**

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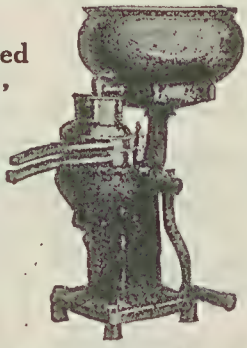

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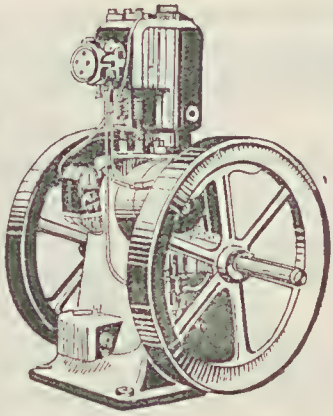

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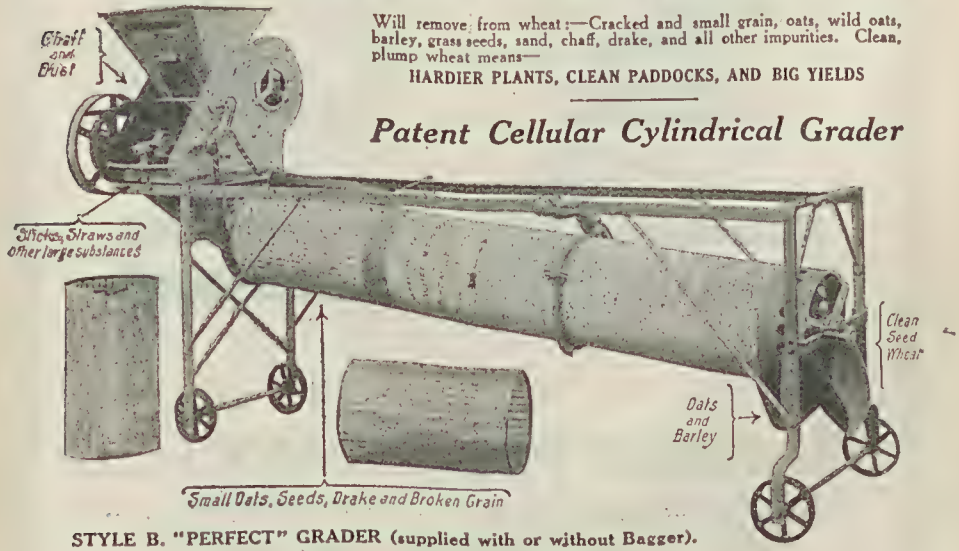
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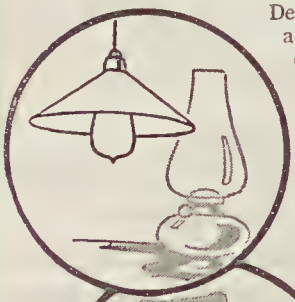

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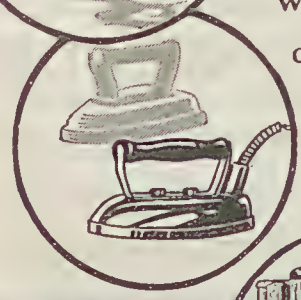

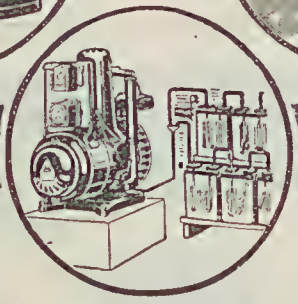

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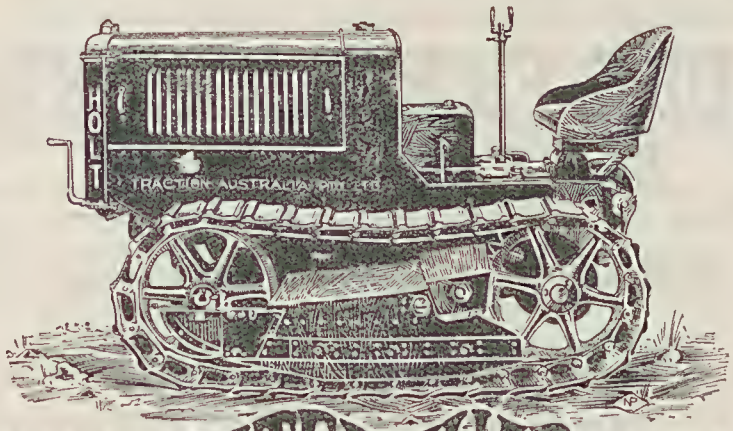

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PURE FRIESIAN HERD

Bull Calves for Sale

(1) Bull Calf *ex* Dominion Belle Corona

Dropped 24th January, 1923

(Registered No. of Dam 369 Friesian Herd Book of Australia, Vol. 2).

Sire: **Victoria Songboy (359)** by Dominion Domino Dutch Boy (1206 N.Z F.H.B.) (73 F.H.B.A.).

Sire of Dam: **Oak de Kol 2nd Homestead Fobes** (imp. to N.Z. from America) (341 N.Z.F.H.B.).

Dam's Record for 273 days under Government Herd Test—
11,646 lbs. Milk, 3·61 Test, 420 lbs. Butter Fat.

For Full Lactation Period—
11,715 lbs. Milk, 3·61 Test, 424 lbs. Butter Fat.

(2) Bull Calf *ex* Dominion Proud Lassie

Dropped 26th February, 1923

(Registered No. of Dam 368 Friesian Herd Book of Australia, Vol. 2).

Sire: **Victoria Songboy (359)** by Dominion Domino Dutch Boy (as above).

Sire of Dam: **Woodcrest Jo** (imp. to N.Z. from America) (334 N.Z.F.H.B.).

Dam's Record for 273 days under Government Herd Test—
11,336 lbs. Milk, 3·42 Test, 387 lbs. Butter Fat.

For Full Lactation Period—
12,216 lbs. Milk, 3·51 Test, 428 lbs. Butter Fat.

(3) Bull Calf *ex* Dominion Hyacinth

Dropped 29th August, 1923

(Registered No. of Dam 374 Friesian Herd Book of Australia, Vol. 2).

Sire: **Victoria Songboy (359)** by Dominion Domino Dutch Boy (as above).

Sire of Dam: **Oak de Kol 2nd Homestead Fobes** (imp. to N.Z. from America) (341 N.Z.F.H.B.).

Dam's Record for 273 days under Government Herd Test—
11,512 lbs. Milk, 4·08 Test, 479 lbs. Butter Fat.

For Full Lactation Period—
13,898 lbs. Milk, 4·24 Test, 589 lbs. Butter Fat.

The record of Victoria Songboy's dam DOMINION MADRIGAL for 273 days under Government Herd Test is 11,373 lbs. Milk, 3·93 Test, 448 lbs. Butter Fat; and for Full Lactation Period 13,485 lbs. Milk, 4·17 Test, and 563 lbs. Butter Fat. "Dominion Madrigal" is a full sister to "DOMINION QUEEN MERCEDES," third cow of all breeds under Government Herd Test 1923, and Winner "Weekly Times" Butter Competition, Melbourne Royal Show 1923, and Champion Melbourne Royal Show 1923.

INSPECTION of these Bull Calves at the Horticultural Gardens, Burnley, is invited.

APPLICATION FOR PURCHASE to Dr. S. S. Cameron,
Director of Agriculture, Melbourne.

DEPARTMENT OF AGRICULTURE, VICTORIA

Red Poll Dairy Herd

The Department will shortly have completed the orders for calves that were booked ahead of calving when the advertisement was withdrawn; consequently the booking of orders for bull calves from the forthcoming calvings has now been resumed.

BULL CALVES are sold for delivery at a month old at prices based approximately on the actual milk and butter fat record of the dam at the rate of 1s. per lb. of butter *fat* yielded.

(For Record of Yields of dams see Red Poll Herd Book.)

The Bulls in Use include—

LONGFORD MAJOR (Imported)

Dam's Record	14713 lbs. milk	...	6 years average	11338 lbs. milk	
G. Dam's	,, 10548 ,,	...	4 ,,	,,	9135	,,

BELLIGERENT (Imported)

	Dam's Record (1st milking)	7144 lbs. milk.				
Dam's Dam's	,,	14533 lbs. milk	...	4 years average	12871	lbs. milk
Sire's Dam's	,,	10370 ,,	...	7 ,, ,,	9354	,,
Sire's D. Dam's	,,	9510 ,,	...	12 ,, ,,	8033	,,
G. Sire's D. Dam's	,,	10215 ,,	...	7 ,, ,,	9386	,,
G.G. Sire's D. Dam's	,,	12565 ,,	...	10 ,, ,,	8853	,,
G.G.G. Sire's D. Dam's	,,	10088 ,,	...	2 ,, ,,	9754	,,

Inspection of the Herd is Invited.

Visitors will be met at the Station on notifying the Manager, Research Farm, Werribee.

Application for purchase to

Dr. S. S. CAMERON, DIRECTOR OF AGRICULTURE, MELBOURNE.

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A quick and uniform germination.
An even stand of vigorous growth.
A heavier and more valuable crop.

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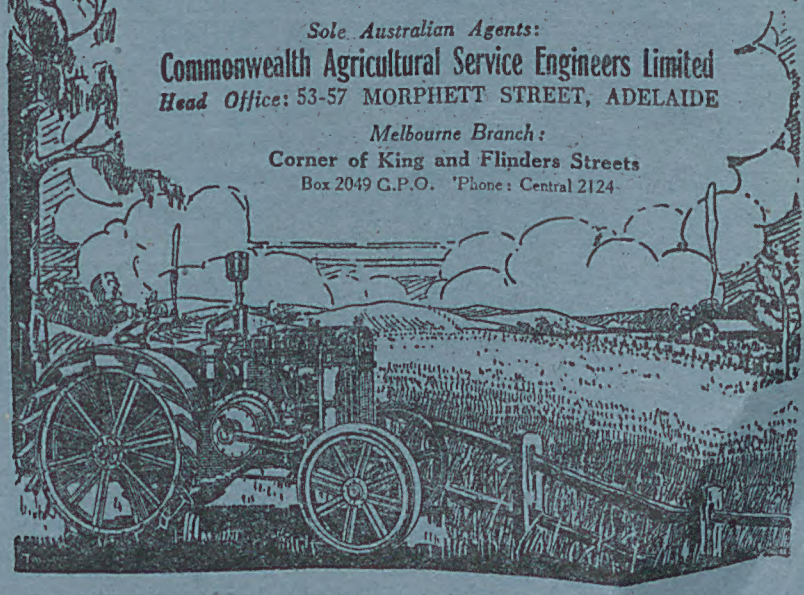
Box 2049 G.P.O. 'Phone: Central 2124



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